MODEL AIRPLANE NEWS

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THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

May 1995

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MAY 1995 VOLUME 123, NUMBER 5

MODEL AIRPLANE NEWS

FEATURES

ABOVE: *a very attractive T-Bird, built from a BVM kit and finished in a colorful Navy "B" model scheme, seems to be heading for oblivion as it gets caught up in a crosswind landing. Remarkably, no serious damage was sustained. Photo by Rich Uravitch.*

ON THE COVER: *this could be the year of the T-Bird! With large-size offerings available now from both BVM and JMP and another rumored from Byron Originals, lovers of Lockheed's trainer will have choices. This one, in the Thunderbird's scheme, is from a JMP kit and was seen at the Superman Fan Fly. See the full coverage of this great event in this issue. Photo by Rich Uravitch.*

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

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EDITORIAL

FRANK MASI

FOR THE FUN OF IT!

In our January '95 "Editorial," editor-in-chief Tom Atwood asked readers to send in descriptions of their clubs' most outrageous fun-fly events. The response indicates that just about any plane can be used in a fun-fly; however, judging by the nature of the events themselves, the planes should be semi-expendable (read the event descriptions; you'll understand why!). Some clubs adhere to traditional fun-fly parameters (bomb-drops, spot-landings, etc.), while others add various twists to the format to spice things up a bit. Other clubs have come up with some pretty strange stuff! The following are some of the more notable events taken from your responses. As always, safety must be the first consideration when planning an event.

Fun-fly activity in Sayre, PA. Bob Hastings checks the engine of his competition ship while Valley R/C club member Steve Luchaco officiates. Photo by Gerry Yarrish.

• **A variation of the traditional balloon-bust.** A balloon is fastened to a balsa stick that's attached to an R/C car (expendable, according to the club that thought this up). Goal: burst the balloon while the car tries to evade your passes.

• **Instrument flying.** This event is performed with two-man teams using a buddy-box system. The pilot (flying with a slave transmitter) has 30 seconds to climb to altitude and trim the plane. The pilot then faces away from the runway and the "copilot" (with the master transmitter) tells the pilot which control inputs to give the plane. The pilot who goes the longest without looking at the plane wins the event. Bonus points are awarded for each complete loop.

• **Carrier landing.** A 5-foot-high ribbon is placed across the end of a "carrier" target marked on the runway. The pilot must fly over the ribbon and land on the "deck" of the carrier. The plane can't taxi past the boundary of the carrier target.

• **Le Mans start.** The pilot removes the prop and nut from the plane. Three groups of fliers are lined up 50 feet in front of their planes. At the start, a pilot runs to the plane while balancing the nut on the prop. Pilots must re-attach the prop, start the engine and take off successfully. This is a timed event; the clock stops when the plane takes off.

Variations on this event include having the pilot driven around a designated course in a wheelbarrow by a blindfolded wheelbarrow driver! Also, to complete the course, the pilot can ride a unicycle, a donkey, or a pony. It's recommended that proper insurance or waivers be in place. Of course, videos of this event have proven entertaining at club banquets.

• **Servo-assist bomb-drop.** Using double-sided adhesive tape, attach a servo to the side of the plane. A large washer, attached to a short piece of ribbon, is placed over the forward-facing portion of the servo arm. When the arm rotates downward, the "bomb" drops off. If necessary, the servo arm can be extended with a piece of music wire. Hitting the target is the goal.

Thanks to Bill Kitchen, treasurer and fun-fly chairman of the Condors Radio Control Club of Visalia, CA; Dan Luchaco, President of the NCFFA (National Competition Fun-Fly Associaton); and Jef Raskin of the San Francisco Vultures for their contributions.

MORE FUN-FLY NEWS

The NCFFA rules now include two new categories in addition to the Unlimited Category. Those who have unmodified fun-fly ships built from kits may participate in the Manufacturers Category. Limitations on modifications, weight, control and mufflers make this class ideal for competition fun-fly pilots who don't want to compete in the "anything goes" Unlimited Class. The Fun-Fly Event Category is open to all aircraft except stick- and boom-type ships. Divisions of this category include Sportsman (an entry-level class) and Masters (for more experienced fliers). If you would like more information on the NCFFA (which has recently been accepted as an AMA special-interest group), write to Tom Holmes, NCFFA Secretary, 9 Jervey Rd., Greensville, SC 29609.

We've seen continued growth in the fun-fly field with clubs and the manufacturing community. A feature article on this subject is planned for a future issue, and it will include more detailed information on the types of events flown at fun-fly meets as well as tips on how to improve your performance at a fun fly. If you would like to see more fun-fly coverage in the pages of *Model Airplane News*, send your comments and suggestions to Debra Sharp, Assistant Editor, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897, or e-mail debs@airage.com. ■

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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

ONLINE MODELING

I'm in the Air Force and stationed in Okinawa, Japan. I'm an avid reader of *Model Airplane News* and just wanted to applaud you on your recent articles on how computers relate to this wonderful hobby. I've been stationed in Japan for almost 14 years and have missed a lot of what's happening in the U.S. Through your articles, I discovered Internet and have been using it daily to communicate with modelers around the world. (Our "big blue marble" gets smaller every day!) Without your articles, I'd still be unable to converse with modelers in the U.S. and elsewhere. I've even taken on the task of running the next Dawn-to-Dusk Challenge glider contest, which, thus far, is being run through e-mail and Telnet. Please keep the articles coming! I can't wait to see how I can further use my computer to tie my two hobbies together!

S.SGT. JAMES PROUTY
Okinawa, Japan

S.Sgt. Prouty, we're glad that you liked Dave Garwood's article on online services. By now, you've also seen Dave's January '95 article on model design software, and you'll find Dave's article on in-flight simulators (April '95) interesting. In our next issue, we start a new column on software and online services for modelers. Anyway, it's great to hear from you; maybe you could keep us informed about R/C in Japan? FM

GIANT-SCALE RACING

Just a couple of comments regarding the February issue's "Editorial" ("Giant-Scale Racing in Transition"). I attended the fall race at Madera as a crewman for an AT-6 entry. This was the first giant-scale meet I had attended, and I came away with some very strong impressions, although one race does not an expert make. I couldn't agree more with your comments. These races have very strong spectator appeal and could do a lot to further the image of our hobby. Along with $25, I sent the following to USRA: "Gentlemen: Enclosed is my personal check for membership in USRA. Please keep the hat (I don't wear 'em), but do send a copy of whatever current rules and racing class specifications you have for the coming season. I'm very much in favor of your goals as reported by Frank Tiano in *Model Airplane News* regarding giant-scale racing. I also agree with Frank Masi's Editorial in the same issue. It appears to me that this part of the hobby is moving toward becoming semi-professional and, thus, to sustain and nurture it will require cohesive direction. This is not a time for in-fighting.

"While I have your attention, I'd like to point out that there could be a better entry class for novice giant-scale racers than the AT-6 class. The 1/5-scale AT-6 airplane's inherent landing characteristics and unforgiving landing gear dissuade many prospective entrants. I know several potential pylon racers who have decided not to race—or even fly—AT-6s for that reason. The Formula One class would make a better choice. The specifications for the full-size class ensure more or less similar scaled airplanes. By keeping the airplanes scale in appearance, and by using a stock engine (preferably an inexpensive one that can be completely cowled within the cheek cowls), stock fuel and a stock prop and airfoils with good handling characteristics, we can be assured of airplanes that are easy to fly and that can be flown at most sport flying sites. I guess I'm saying I like the 13 percent wing thickness. If the specifications are set up right, these race planes could even be competitive in scale and sport aerobatics. The fixed gear will make the airplanes more forgiving of hard landings, and the variety of designs will be an additional encouragement to build. But do set the minimum weight to be at least 28 to 30 pounds. Any less may encourage some unsafe structures. After having built

several AT-6s and seen several airplanes fail structurally during races, I believe that 25 pounds all-up weight for aircraft with more wing area and larger fuselages will be very hard to do safely."

Thanks for listening; and good luck to us all.

TONY HOWARD
Monroe, WA

The Madera Air Race group developed the Formula One class to fill the gap between the AT-6 and Unlimited classes. Formula One, like Unlimited, allows engine modification; GSARA accepted the Madera rules for Formula One, which specify a 4.6ci engine limit and a 13-percent airfoil thickness, partly to prevent the possibility of structural failures that could occur with greater engine displacement and thinner wings.

The Unlimited Scale Racing Association restricts airfoil thickness to 10 percent and engine displacement to 6ci in Formula One. In the interest of continued growth in giant-scale racing, perhaps both groups should compromise on this issue.

In a letter to the AMA (included as part of a recent GSARA newsletter), Lesley Burnett cites the modification of GSARA's Formula One rules to allow a 10-percent airfoil thickness in any plane with a wing-root chord (at the wing center) of 27 inches or more. They are, however, remaining firm on the issue of engine displacement; they feel that larger engines would certainly push the Formula One speeds to near those of the Unlimited class. GSARA is currently evaluating the neccessity of engine restriction in Unlimited planes owing to the frequency of structural failure occurring at 200-plus miles per hour. FM

ERRATA

In the Buyers' Guide Section of our March issue, we gave an incorrect area code in the phone number for Chapis plans. The correct phone number is (302) 629-6373.

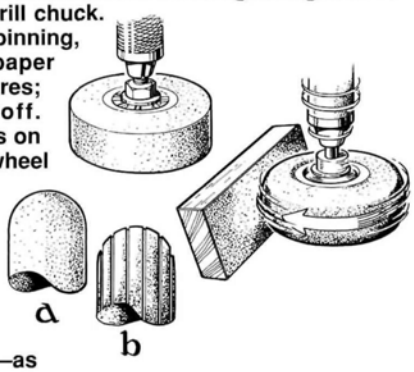
HINTS & KINKS

JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

FOAM-WHEEL SHAPER

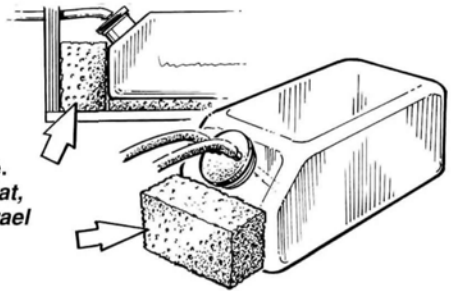
A screw, washers and a nut secure these lightweight Dave Brown wheels in a drill chuck. While the wheel is spinning, use a coarse sandpaper block to bevel the tires; then round them off. Note that the block is on the left side of the wheel so that it doesn't kick back. Make a smooth tread (a) or, with a hacksaw blade supported on a rest, make rib treads (b). Wear safety glasses, and—as your columnist can attest to—a plastic, garbage-bag apron up to your neck! R.W. says that the original-design tire slides sideways on takeoff and landing. These modified tires track much better. *R.W. Bruckner, Grove, OK*



STOP STARVATION

Glue a block of sponge rubber (not plastic foam) or even Styrofoam ahead of the fuel tank so that the fuel lines aren't pinched shut during a sudden stop. This setup also prevents the tank from being punctured by engine-mounting screws. Do *not* use Styrofoam with gasoline; it will dissolve.

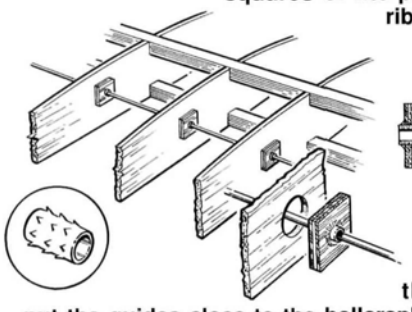
Yaron Koriat, Barkan, Israel



PUSHROD GUIDES

For music-wire pushrods, drill oversize holes in the ribs, then make these guides out of 5/32-inch-diameter (4mm) pieces of inner Nyrod that are glued through small squares of lite-ply. If you don't have ribbed Nyrod, cut small barbs in smooth Nyrod using a sharp blade (glue will really hold onto those barbs). Tape the guides in place, and move them around until they're perfectly aligned, then glue them with CA. Don't put the guides close to the bellcranks or the servo arms; the rod will bind because of the deflection.

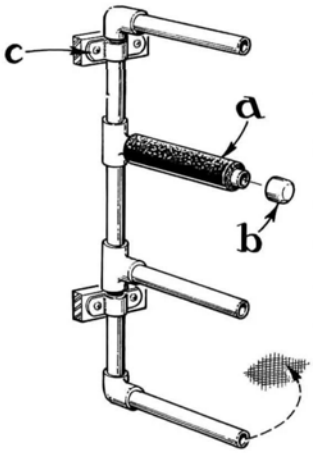
Walter Perrin Jr., Granada Hills, CA



PIPED WING RACK

This rack is made of PVC plumbing pipe, T's and elbows that have been glued together with pipe cement. The verticals are 8 inches (200mm) tall, while the horizontals are sized to fit your wings. Foam tubing (a) is an option, and it can be held in place with a pipe cap (b). Secured to the shop wall with pipe clips (c), the rack can be swung flat against the wall when it's not needed.

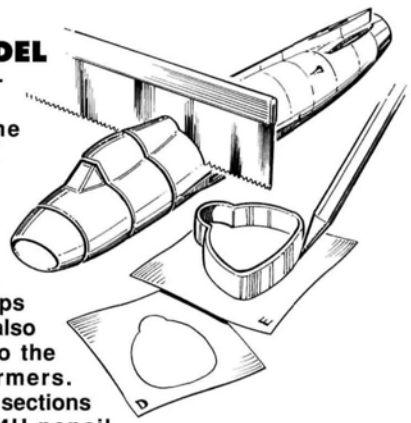
Laurence Bixby, Whitefish, MT



SCALE-A-MODEL

In addition to projecting three-view drawings onto the wall to enlarge and trace them, Dean slices up a plastic model, presses the sections onto an ink pad and then stamps them on paper. He also projects these onto the wall to obtain formers. Tracing around the sections with a sharp no. 4H pencil gives a better, sharper image for projection.

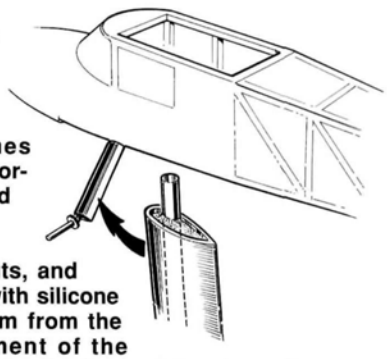
W. Dean Drover, St. John's, Newfoundland, Canada



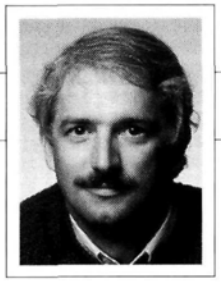
STREAMLINED FAIRINGS

These streamlined plastic grippers, about 9 inches (230mm) long, are normally used to bind papers. Clip them around landing gears and wing struts, and hold them in place with silicone glue or CA. Get them from the stationery department of the drugstore. Chrome-plastic door edging from the auto-parts department also works very well.

Kristoffer Tonnessen, Forus, Norway



AEROBATICS MADE EASY



DAVE PATRICK

LEARN THE HUMPTY BUMP

ONE THING about flying an R/C airplane never changes: sooner or later, you'll have to turn it around, or your plane will simply fly away! There are many ways to do this, but in R/C aerobatics, the Humpty Bump may be the most popular. It has many variations, and it really isn't that difficult to do. It's easy to learn and a great way to make a 180-degree turn, and it can put you back on exactly the same line, i.e., heading and altitude that you started on.

BIT BY BIT

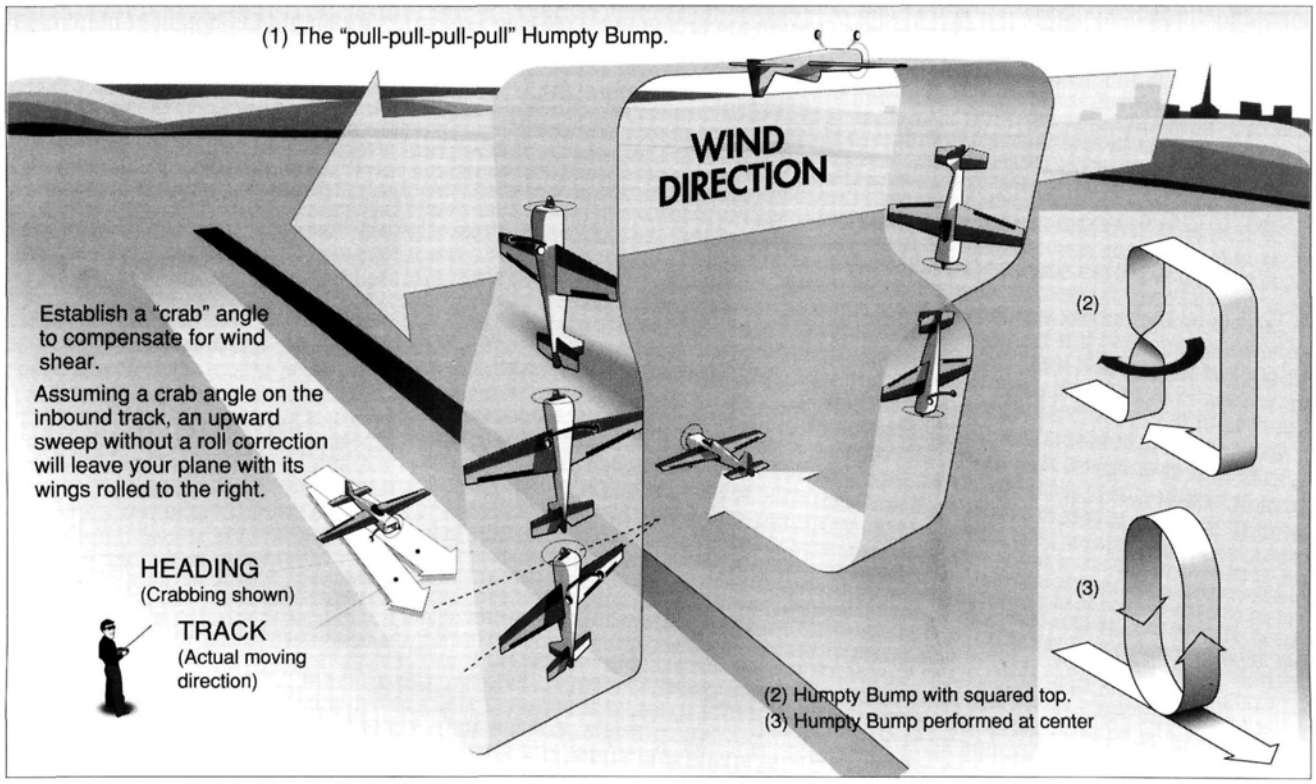
Like most maneuvers, the Humpty Bump can be reduced to a few basic components. Here's what I consider to be a basic Humpty Bump: pull into a ¼ loop to establish a vertical up-line. Next, perform a ½ roll, and pull (again) into a ½ loop. This takes you over the top into a vertical down-line. You'll have to pull again to level flight. This maneuver is called a "pull-pull-pull Humpty Bump." When it's flown as a maneuver to simply turn your airplane around, precision isn't that important. Nonetheless, be as precise as possible, because this keeps you focused and improves your flying skills.

Now that you know what a Humpty Bump is, let's work on some details (which is necessary if you really want to be in full control of your aircraft). It's amazing how a few tiny "fixes" here and there can really clean up a maneuver. The exit and the entry can be at different altitudes, but the rolls must always be centered in the straight portion. This is of real benefit because if you find yourself at too high an altitude, after, let's say, a 4-point roll, the Humpty Bump can be used to put you back at the desired altitude by simply exiting at your preferred lower position.

Another important point—all "pulls" or partial loops should be of the same size. It's very tempting to pull sharply during the first pull-up and then make a larger, round "top" with an even larger radius pull-out. This is a common error that's easy to spot when the Humpty Bump is performed as a center maneuver.

IN A CROSSWIND

If you try a Humpty Bump in a crosswind (which almost always seems to be the case), you should have already established a crab angle to compensate for the wind, i.e., if the wind is in your face and you're starting the maneuver along a left-to-right track, your aircraft should have a heading that's to the left of the actual track or path along which it is flying. (Heading is the direction in which the aircraft is pointing; track is where the plane actually goes.) In other words, the nose should be yawed



slightly into the crosswind.

When you pull up for the first portion of the maneuver, you'll need right rudder and some left aileron to put you on a vertical line. Here's why: assume that your plane has a 10-degree leftward yaw before you pull to vertical. When you pull, the nose sweeps upward into an arc that, if continued after you reach vertical, would ultimately sweep rearward and to the right. Because the wings are at right angles to the plane of this arc, the right wing will be rolled slightly "forward" as the plane pulls to vertical. Consequently, as you pull to vertical, the 10-degree crab angle results in a 10-degree right-roll error. This, in turn, requires a 10-degree left-aileron correction, which should be input gently during the pull-up. Think about this maneuver as you do it, and be careful not to overcompensate.

A HINT ABOUT RUDDER

Right rudder is almost always needed during most positive pulls. As the airplane pulls into a vertical up-line, it rotates to higher angles of attack and its air speed diminishes. During the positive pull, the influence of asymmetrical propeller thrust, P-factor and, particularly, torque becomes more pronounced. To help offset these factors, add a small amount of right rudder as you pull up.

In a crosswind, the plane will still need a slight crab angle after you've pulled to a vertical up-line. Because the yaw angle really shows when you fly a vertical line, I like to compensate for it by reducing the yaw with a little more right rudder. I then increase the crab angle when the plane is back to horizontal flight on the return line. Technically, it can be argued that the yaw angle should be increased in a vertical up-line in a crosswind because the aircraft slows down naturally, and the tendency is for the yaw to increase. Yet, this doesn't always look right, so I try not to let it happen.

If you don't yaw the plane in a crosswind, the plane will move in the direction of the wind; this is sometimes called "blow-in." I'll often split the difference by removing some yaw and accepting some blow-in.

Once you've established your vertical up-line and the amount of rudder you'll need, don't forget to reverse the rudder input when you execute a ½ roll. I like to change rudder direction gently during the roll. Try it; this works well.

A FEW VARIATIONS

Let's look at a few variations. I haven't counted the number of variations, but you can be a little creative and add to the list mentioned here. One Humpty Bump can even help you deal with a crosswind. Let's say there's wind in your face, and your plane is flying from left to right (see illustration 1). This is commonly called a "pull-pull-pull-pull" with ¼ rolls. Note that the first roll (up) is a left roll, and the second roll on the vertical down-line is a ¼ right roll.

Good news here: the length of the straight lines isn't that important. Rolls must still be centered in the straight portions. This is very handy because you can compensate for altitude by exiting at the desired altitude and compensate for the crosswind by adjusting the length of the top. Again, all radiuses must be equal. It's not that easy; try it!

Humpty Bumps are not limited to turnaround situations. Illustration 3 shows a Humpty that can be performed at center. This variation is a good one to practice. Note that this Humpty is not of a turnaround variety, and entry and exit are at the same altitudes.

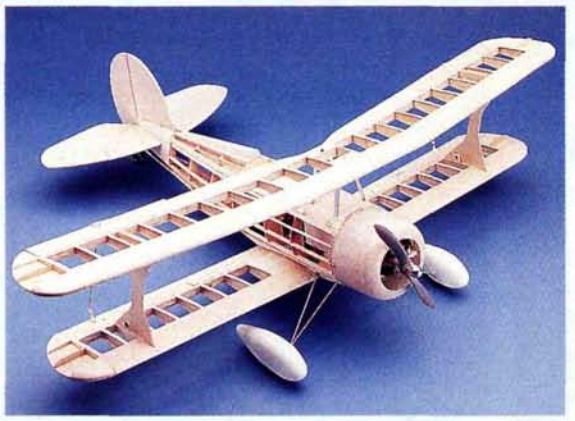
IN CLOSING

This should cover the basic types of Humpty Bump. Remember, you can enter or exit inverted, too. At the TOC, they came up with all kinds of interesting flavors! As you become more involved with aerobatics, you'll become more exposed to the Humpty and its benefits. When you're out flying, even just for fun, it's a good maneuver to constantly practice and practice. Till next time.... ■

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

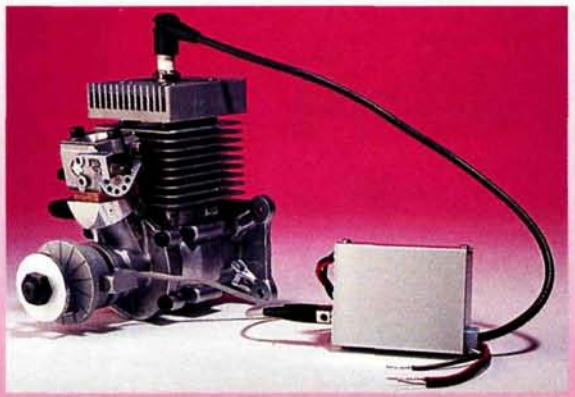


Model Tech Great Lakes

Model Tech's name is familiar to all but the newest inductees of R/C. The name is synonymous with outstanding workmanship. Like the rest of the Model Tech line, this 47-inch-span, all-wood, ARF, Great Lakes biplane comes hand-built, sanded and ready to cover. Even the wing halves are joined. The kit features: molded-fiberglass cowl; plastic wheel pants; pre-shaped landing gear; and pre-shaped cabane and interplane struts. The distributor tells me that shipment will start in July, and the price is expected to be "shockingly" low! If you love bipes built of balsa, Model Tech has done the work for you. Contact Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Mathe 35 Aero Spark

The Italian Mathe (math´-a) 35 features front induction by means of a Zimmerman disk that's similar to those found on rear-rotor-disk intake engines. According to the distributor, B.H. Hanson, this feature improves efficiency and power-to-weight ratio. The Mathe's crankshaft is supported by three precision bearings, and the connecting rod incorporates needle-roller bearings—top and bottom. The piston and sleeve are true ABC design, and the piston has two compression rings. The engine comes with fully adjustable electronic timing so that changes can be made in accordance with octane and prop changes. The carburetor has a built-in diaphragm fuel pump, and the all-up weight with ignition is 4 pounds. Reported horsepower ratings are: gas ignition—4hp at 8,800rpm on an 18x8 prop; and glow—5.5hp at 8,800rpm on an 18x10 prop. Did I forget to mention that a glow version is in the works? Well, it is. For more information, contact B.H. Hanson, 7380 S. Eastern Ave., Ste. 124-176, Las Vegas, NV 89123; (702) 436-4422; fax (702) 436-4416.



Lanier's 37% 300 S

Seems as if Lanier RC is always right on top of what's happening. Here's their new 102.5-inch-span, 20- to 25-pound Extra 300 S designed by Bob Godfrey, who also designed the 1990, 1992 and 1994 Tournament of Champions-winning aircraft. The Extra features the popular Stinger-type construction, which has a built-up fuselage and tail group, partially sheeted foam wings and Lanier's famous formed-plastic turtle deck (this speeds up construction). The required engine sizes are: 3.2 to 5.8ci 2-stroke gas, or 3ci or larger 4-stroke glow. For more information, contact Lanier RC, P.O. Box 458, Oakwood, GA 30566; (404) 532-6401; fax (404) 532-2163.

A BEE IN A BOX

Under license from Clancy aviation, Cox Hobbies is now offering an ARF version of that all-time favorite "ball-field bomber"—the 39-inch-span Lazy Bee. According to Cox, the Bee weighs in at 24 ounces. With an estimated wing area of 500 square inches, the wing loading is an astounding 6.9 ounces per square foot! That makes the Bee truly capable of flying in confined areas.

The Bee is made primarily out of expanded polystyrene bead foam, and the nose and hardware are injection-molded polypropylene. The special blow-molded wheels are even lighter than foam wheels. Included with the Bee is Cox's most powerful reed-valve .049 engine, which uses the same cylinder porting as their Dragonfly front-rotary-induction engine. The Bee is obviously light enough to thermal-soar, and it flies slow enough to stay within a softball infield. Whether you're a beginner or an experienced pilot just looking to do some schoolyard bush-piloting, the Lazy Bee is an instant answer. I think they have a real winner here. For more information, contact Cox Hobbies Inc., 350 W. Rincon St., Corona, CA 91720-2004; (909) 278-1282; fax (909) 278-2981.

Thunder Tiger has modified the nose of their Windstar to accept a 540PH electric motor and a Graupner folding prop, thereby creating the new Windstar EP. This design is reported to perform very well on a standard 6-cell 1400 SCR pack. Like the original Windstar, the EP is an ARF and includes a prop and a motor. You'll have to add a radio (2- or 3-channel), a battery pack and an appropriate electronic speed control, or auto cutoff system. The Windstar EP will be available this summer, and the "street price" is projected to be about $110. For more information, contact Thunder Tiger USA, 2430 Lacy Lane #120, Carrollton, TX 75006; (214) 243-8238; fax (214) 243-8255.

Watt-Star

Mustang 50 FROM BYRON

According to Marc Jensen at Byron Originals, "The new Mustang 50 is the smoothest, most powerful engine in the 50cc class we have ever run. The Mustang is vibration-free (allowing greater power transmission to the prop) and is capable of performance even larger engines cannot deliver." A glow conversion is available and takes only minutes to install. Byron's performance specs are: 7,900rpm on an 18x10 prop; 8,200rpm on an 18x8/14 prop; and 7,000rpm on a 20x10 prop. Noted Top Gun contender Diego Lopez had this to say about the engine: "The Mustang 50 is super-reliable and extremely smooth. I highly recommend it for scale projects as well as for fun-fly airplanes." *Model Airplane News'* very own Mike "Professor" Billinton will do a full report on the Mustang 50 in the fall. It's available from Byron Originals and Byron dealers for approximately $375. Contact Byron Originals Inc., P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1995. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

WINNERS

Judging from the number of entries we receive throughout the year, "Pilot Projects" continues to be our most popular department. It's one of our favorites, as well, because it allows us to see what our readers are up to. Choosing which entries to publish each month isn't an easy task; and choosing the three top projects of '94 wasn't any easier. We're sure, however, you'll agree that these planes—and their pilots—are winners!

1ST PLACE

Hans Heck of Stirling, Australia, wins $500 for his scratch-built OV-10A Bronco counterinsurgency aircraft. Hans spent four years on this project, and he also designed and built the model's scale retracts using mainly carbon-epoxy components. The 72-inch-span model weighs 15.4 pounds, and it's powered by two O.S. .40 FSR engines.

2ND PLACE

For his '29 Dornier, DO-X transcontinental transport, Jon Christenson of Minneapolis, MN, wins a one-year subscription to *Model Airplane News* and a set of Air Age Publishing model aviation books. Powered by 12 extensively modified Cox Queen Bee engines equipped with .09 pistons and cylinders, bronze bushings and modified carburetors, the 96-inch-span model must sound great!

3RD PLACE

A one-year subscription to *Model Airplane News* and a set of Air Age Publishing model aviation books go to Phil Yovino of Port Washington, NY, for his 90-inch-span Boeing F4B-2 bipe. He built the 21-pound model from Bob Morse drawings, and he covered it with Supershrink Coverite and painted it with Krylon paint.

1/4-SCALE CORSAIR

Louis Pepe Jr. of Hawthorne, NJ, built this F-4U from Nick Ziroli plans. The fuselage, wings, tail assembly and control surfaces are builtup, and the model has six operational flaps, 12 servos and working bay doors. A G-62 engine spinning a handmade scale prop keeps this 30-pound bird in the air.

PILOT PROJECTS

CLOUD DANCER

This low-wing model belongs to Marc Sharpe of Baudette, MN, who constructed it from Fred Reese plans. The 73-inch-span plane is constructed of balsa and plywood and weighs only 6 or 7 pounds owing to its design. Marc says that the model flies well and that a Fox .46 provides more than enough power. He finished the plane with Black Baron film in his own trim design. It's a knockout, Marc.

1/4-SCALE RACER

Buddy Clontz's latest scratch-built project—this 1/4-scale Gee Bee "Z"—weighs 18 pounds and is powered by a SuperTigre 2500. Buddy, who lives in Tabor City, NC, says that the Frank Tiano Enterprises dummy radial engine he used "really did the trick when it came time to balance the plane." The model's great paint scheme was created with Coverite's 21st Century fabric. Buddy's Gee Bee R-1 was featured in the September '93 "Pilot Projects"; we think this Gee Bee is another winner!

O CANADA!

This Walt Moucha P.J. 295 kit is the handiwork of Bruce Payne of Simcoe, Ontario, Canada. The 20-pound bipe has 81- and 71-inch top and bottom wingspans and is 64½ inches long. Powered by a Zenoah G-62 on an 80:1 mixture, the P.J. is "wonderful, and it sure loves to fly." Bruce used royal- and light-blue MonoKote to create the model's striking, patriotic scheme.

ELECTRIC ESTRELLITA

Mac Kieltyka of Huntington Beach, CA, converted this glow-powered racer into an electric model. He built the plane according to *Model Airplane News* plans, then he fiberglassed the fuselage and knocked out the balsa formers to create a true monocoque fuselage that has ample room for a speed control, an Astro .25 motor and 16 cells. Mac says that the plane flies "as if it's on rails" and is as fast as the original gas version was in the '60s and '70s.

EXCEPTIONAL EXTRA

Larry Meddock of Orlando, FL, sent this photo of his Goldberg Extra 300 that he modified to look like the single-seat, full-size plane in the background. He paid special attention to the wingtip sighting arms, which he made out of brass tube, and he says that the Harris smoke system works exceptionally well. After a few flights, Larry removed the hardware, and the owner of the full-size plane has hung the model in place of a chandelier in his foyer.

TWICE AS NICE

Kenneth Fiala of Sunland, CA, built this 50-Caliber model from *Model Airplane News* plans. Powered by two Royal .45 ABC engines, the plane has a lot of speed at full throttle and flies pattern maneuvers with ease. Kenneth says that he has made 24 flights with it, and although he lost an engine three times during maneuvers, he just brought the plane around and landed without a problem. Who says that twin-engine planes are difficult to fly?

HOW TO

The ultimate in scale paint jobs!

by JIM SANDQUIST

Finish Models With Dope

THERE ALWAYS seems to be one talented guy who continually shows up at competitions with beautiful, butyrate-dope-finished models. What a terrific way to finish a model! It always looks great, it never sags, it's impervious to fuel, and it's highly admired by other modelers. If you've ever looked at dope-finished models and thought, "Boy, I wish I could finish my planes like that," read on. I'll show you the technique I learned from an old-time modeler.

FULL-SIZE FINISHES

This finishing technique is the one that's used to cover full-scale aircraft. Although some of the dope-and-fabric-finish process is difficult to put into words, I'll try to take you from start to finish.

Several butyrate and nitrate dope products are available. Randolph Products* makes good dopes for the full-size-aircraft industry, and Sig Mfg. Co.* provides a complete line of nitrate and butyrate dopes in a variety of colors. Sig's products are probably the most readily available and are bottled in small quantities that are convenient for smaller modeling projects. They're available directly from Sig and at most hobby stores.

This process is not much more difficult than other means of finishing, and the cost is close to that of the average iron-on coverings. Remember, high-quality workmanship usually takes a little extra effort, and you'll find that this is worth the time.

MIXING TECHNIQUE

Before you start to cover the airframe, you need to make three different dope formulas—approximately 1 quart each—mixed to a brushing consistency so that they can be brushed onto the airframe and the covering material. In one container, mix clear butyrate dope and thinner to a ratio of approximately 60-percent dope and 40-percent thinner. Stir vigorously until well mixed. Keep in mind that this ratio is approximate; some brands of butyrate may be slightly thicker than others. You want a mixture that's slightly thicker than straight thinner. In another container, mix the nitrate dope and nitrate thinner in the same way.

In a third container, mix butyrate dope and butyrate thinner as described, but first add some unscented talcum powder—approximately 1 inch of powder in the bottom of the 1-quart container—for 1 quart of mixed dope and thinner. This will be used for the filler (or base coat). Unscented talcum powder isn't usually available off the shelf, but it can be ordered. One bottle of it costs around $7 and contains enough powder for several models. Don't use scented talcum powder; in some cases, the fragrance in the powder will forever adhere to the aircraft. Set your mixtures aside and prepare the airframe for covering.

PREPARING THE AIRFRAME

An old adage says that, "Your finish is only as good as what's underneath."

MATERIALS

To do a good job of covering a 6- to 8-foot-span airplane, here's what you'll need:

- 1 quart clear butyrate dope
- 1 pint clear nitrate dope
- 1 quart nitrate thinner
- 1 pint silver butyrate dope
- Colored butyrate dope for the final paint finish (your choice)
- 1 pint retarder
- Unscented talcum powder
- 1 can Sig Stix-It or Balsarite
- High-quality camel-hair paint brush at least 1 inch wide.
- Covering fabric (your choice)
- 400-grit wet-or-dry sandpaper
- Quart containers for mixing

PHOTOS BY JIM SANDQUIST

Randolph Products has provided dope-finishing products for the aviation industry for years.

The products you'll need to do a good job include: your choice of dope, Sig Koverall, a tack cloth, adhesive and a camel-hair brush.

Sig dopes are readily available through most hobby shops and directly from the manufacturer. Sig provides everything you need to achieve a great finish.

This really holds true when covering and painting an aircraft. Make sure that your airframe has been well-sanded and that all nicks and dings have been filled. Double-check to ensure that the wing, the tail surfaces and the landing gear all fit well. When you're satisfied that they do, brush one coat of nitrate dope over the entire airframe, and let it dry for about half an hour. When it has dried, sand the airframe to a smooth finish with 320-grit sandpaper. Once this is complete, you can begin to cover your model.

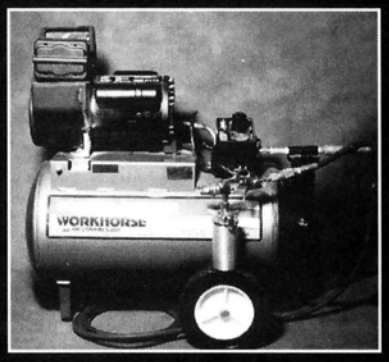
COVERING MATERIALS

For many years, models have been covered with silk, Japanese tissue and silk span. Although these coverings are still used, newer, easier to use, and stronger products have, for the most part, replaced them. Sig's Koverall and Coverite's* Super Coverite are among the best of the new coverings. Because all fabric coverings have a weave, some shrink more in one direction than another, so pay attention to the direction of the weave when you apply the fabric to your model. Which covering should you use? That really depends on you.

• **Super Coverite** is a cloth that's applied like any other iron-on covering. There's a heat-activated adhesive on the covering's back, so application with a covering iron is simple. Unlike other iron-on coverings,

K.J. Miller Corp. of Elkhart, IN, makes good spray-painting equipment that's used by many modelers.

Air compressors such as this are available at hardware stores and home-improvement centers. They provide more than enough air pressure to paint model aircraft.



Painting with Compressors

If you've been in this hobby for any time, you've done some painting. If you're like most of us, you usually reach for a can of spray paint. The more painting you do, the more you find yourself wishing you owned a compressor. There are many options.

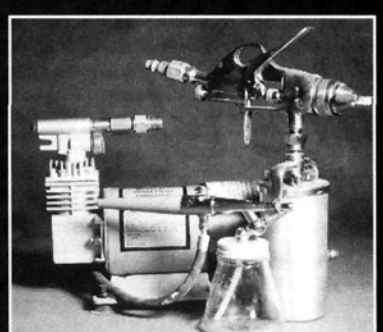
• Possibly the most affordable hobby compressor setup is from K.J. Miller Corp.* Their Model 2000 puts out a constant 20psi and comes with an airbrush, a 1-pint spray bottle, a 1-quart spray bottle and an air hose, and it costs less than $200 (complete).

• Badger Air-Brush Co.* makes a number of small hobby compressors that start at around $150; that doesn't include an airbrush, paint bottles, or a hose. Plan to spend an additional $50 to $100 on these items. Good, artist-quality airbrushes run from $35 to well over $200; if you decide to buy one of these, buy one with a medium tip, and buy a large paint bottle.

• If you have space in your workshop, it might be best to invest in a small commercial compressor. These are available in most home-improvement stores. I have a 2.5hp compressor that will supply 90psi at 5 cubic feet per minute. Units like this cost approximately $175 to $225, plus the cost of the hose, the water trap and a medium-size spray gun. Expect to pay between $250 and $300 for a complete setup.

• Commercial spray guns—often called "touchup guns"—are relatively inexpensive ($30 to $50) and are available from many sources. Automotive painting outlets, hobby shops and department stores carry them. Many mail-order catalogues carry them, too, and these guns are very useful for spraying the clear buildup coats.

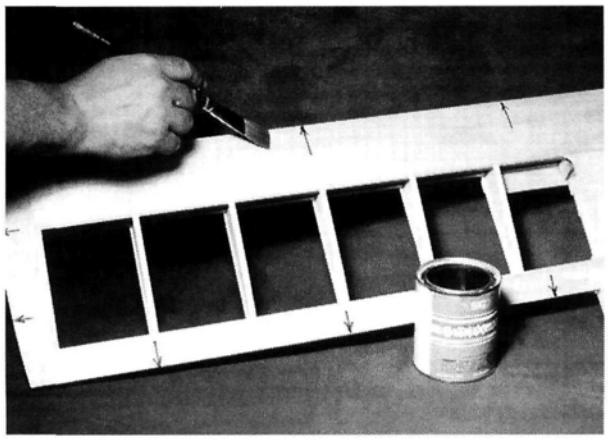
The important thing to remember is that once you've invested in this equipment, you'll be set for many more projects. If you're starting from scratch, check the classified ads in your local paper; they're filled with all kinds of inexpensive treasures. Good hunting and happy spraying!



The Badger Air-Brush Co. makes a very good air compressor as well as other airbrushing equipment, all of which is perfect for applying dope finishes to model airplanes.

however, Super Coverite doesn't have a painted finish. It can easily be applied with no wrinkles, and it shrinks very tightly, so it's the perfect surface for a painted finish. Because it has adhesive already applied to it, you can cut it with a scissors or an X-Acto knife without its fraying. Coverite offers a brush-on adhesive—Balsarite—that dries in minutes and delivers great results.

• **Sig Koverall** cloth is similar to Super Coverite, but it doesn't come with an adhesive on the back of it; you must apply heat-activated adhesive to the structure before you cover it. Koverall tends to fray when it's cut; but that can be prevented by brushing on a light coat of dope and letting it dry before you cut it. Koverall is less expensive because it has no adhesive. Sig offers an adhesive—Stix-It—that dries in minutes and gives good results. Sig manufactures everything for the covering process, and there's no question about compatibility of all the necessary materials. Both materials work well, however, in this article, I will discuss the application of Sig Koverall.



Apply your adhesive (Stix-It or Balsarite) to the perimeter of the wing, as shown by the arrows on the wing in the photograph.

APPLYING FABRIC

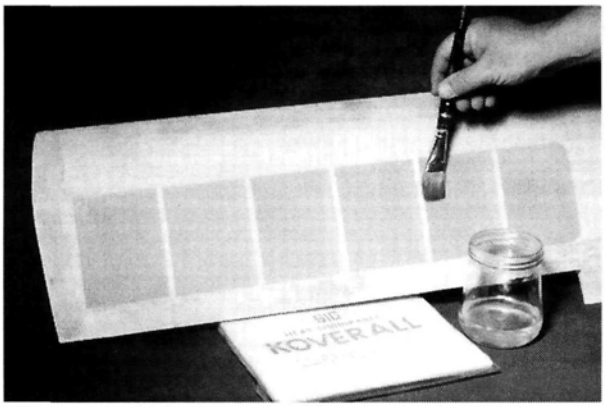
Now that your airframe has been prepped with a coat of nitrate dope, it's time to cover the wing. Brush a coat of heat-activated adhesive onto the trailing edge and the wingtips, and set the wing aside to dry. Meanwhile, cut out a piece of covering that's large enough to be wrapped all the way around the wing. Once the glue has dried, use your hobby iron to stick the fabric into place where you applied the glue.

Remove any large wrinkles by adjusting the material as you iron it into place. Apply another light coat of adhesive over the fabric-covered trailing edge. When it has dried, iron the overlapping covering material down, and trim the edge. Once all the edges have been ironed down and sealed, apply heat to the covering; work from the center outward to remove all the wrinkles and to uniformly tighten the covering material. This process is used on all the other parts of the airframe, including the fuselage, stab, fin, elevators and rudder. Keep all seams as straight as possible, and make all overlaps uniform in width. You'll be amazed at how forgiving fabric covering is; it goes around compound curves easily, and it produces a very strong, tight covering job.

PROPERTIES OF DOPE

Nitrate and butyrate dope each have distinct properties. Dope finishes are used on full-scale, fabric-covered aircraft because dope remains flexible and resists cracking. It takes weeks—even months—for dope to cure fully. But don't worry, you won't have to wait that long to fly your model; dope-finished surfaces dry to the touch very quickly.

Fumes from dope and dope thinners are another consideration and have been known to cause dizziness and headaches. I suggest that you paint your model outdoors or, at the very least, in a well-ventilated room, and wear a snug-fitting respirator paint mask with replaceable filters.



When applying the dope to the fabric, always brush in the same direction, and keep the coats thin to minimize brush marks.

APPLYING DOPE

Use your camel-hair brush to apply a very light coat of nitrate dope to the covering; make sure that it doesn't soak all the way through the weave or fall through to the other side of your wing. Also, be sure to always brush in the same direction and keep the coats very thin. The goal is to fill the fabric weave and allow it to show slightly through your final finish.

Recall that you applied a coat of nitrate dope to your airframe before you covered it. New coats of both butyrate and nitrate dope melt slightly into previously applied coats. Because you applied nitrate to your airframe and are now applying a light coat to the fabric, the fabric will bond to the wooden airframe very firmly. Nitrate dope also sticks to fabric better than butyrate does. This light application of nitrate dope will seal the fabric and provide a good foundation for the butyrate base coat. This is the last step in which you'll use nitrate dope; butyrate will be used for the rest of the finish.

Butyrate dope bonds well to nitrate and gives your model a good fuelproof finish; nitrate dope isn't fuelproof. *Remember, you can apply butyrate over nitrate, but you should not apply nitrate over butyrate!* Next, brush on two coats of butyrate dope, allowing ample drying time between coats. When these have dried, lightly sand with 400-grit wet-or-dry sandpaper. Don't sand through the fabric; just remove the brush marks. Now, apply three more coats of butyrate, lightly sanding between each coat.

By this time, you should have a smooth finish. If you hold the model up to the light, you should see the fabric's weave beginning to fill in. For the remaining base coats, use the butyrate-and-talcum-powder mixture. It acts as a filler and gives a very uniform base. Be sure to stir it very well before and while you apply it. Keep the coats as thin as possible. If the mixture doesn't flow well, or it cakes up when you brush it, add more thinner. Brush on three or four coats, and continue to sand lightly between them. You're looking for a uniformly built-up finish that has a slight sheen. After you have achieved this, you're ready to start spraying.

SPRAYING DOPES

Many modelers are hesitant to spray-paint their models; they either don't have the facilities to paint, or they think they need expensive equipment. Because the dope mixture is thin, it can be applied with only about 25psi of air pressure. This means that you can apply it with one of the smaller hobby sprayers. If you don't have spray equipment, Sig sells dope in aerosol spray cans. For the best possible finish, wipe a clean tack cloth over the model before applying each coat of dope to remove any surface dust.

Another advantage of spraying on dope

is that it dries very quickly, so you can do it either in a garage or outdoors without worrying about excessive overspray. Dope dries so quickly that the overspray is generally dry before it hits the ground, and that makes cleanup easy. A temperature of 70 to 80 degrees with low humidity is ideal for spraying. High humidity can cause "blushing" (discussed later).

FINISHING

• **A silver lining.** Because colored dopes are translucent, before applying them, you must cover the entire model with a very light coat of silver dope to prevent the wood grain from showing through. Generally, two very light coats of silver are enough. Silver isn't a forgiving color, though, and it will reveal most of the imperfections in your base coats. Now is the time to touch up areas that you aren't satisfied with.

• **Applying color.** As is the case with most paints, you apply the lightest color first and put the darker colors over them. Again, keep the paint thin—only slightly thicker than the thinner. Spray it on evenly, and be sure to apply it slightly wet; a dry finish doesn't always bond well. A pressure of 20 to 30psi is adequate; any more than that tends to result in a dry finish and produce more overspray. The best results are achieved by applying many light coats, as opposed to spraying on only a few heavy coats. Runs or dust can be wet-sanded out at any time. Minor scratches caused by sanding will disappear when the final clearcoat is applied.

When you've completed the base color, let the aircraft dry for 24 hours before you mask for the other colors. I use 3M™ vinyl Fine Line masking tape that can be found in every automotive-supply store. When you remove masking tape, slowly pull it back over itself at a low angle to the surface to prevent the paint from being lifted off. When you remove the tape, you may notice that some flashing or paint comes off with it. Don't worry about this, wet-sanding with 400-grit wet-or-dry sandpaper will fix it.

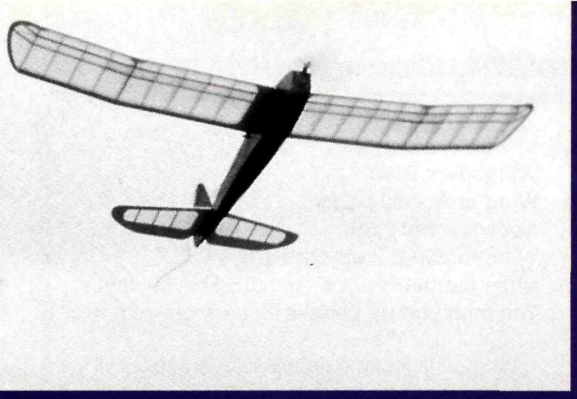
• **Final clearcoat.** When you get to this point, you may notice that some colors look milky or "blushed." This was caused by high humidity when the dope was applied. It can be prevented either by waiting for a very dry day to paint or by adding a small amount of retarder to the dope (available from Sig and Randolph). Blushing disappears when clear dope is applied over it. If you paint on a humid day, add retarder to your clearcoat. The clearcoat—a mixture of clear butyrate dope and butyrate thinner mixed 1:4—should be applied with 20 to 30psi. Applied in thin, uniform, wet coats, the clearcoat really makes your finish shine!

CONCLUSION

Painting always takes a little more effort than using an iron-on finish, but I think the result is always better. If you've ever painted with enamel or polyurethane, I think you'll like working with dope. It has a very short drying time, remains flexible and is very easy to work with. Touchup and repair work are also easy. If you're up to the challenge of something new, I suggest you try this technique—but on a small model first. There's no substitute for actually doing it yourself. Good luck!

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

CONSTRUCTION



***FINDING TIME** to fly has always been a problem for me. In my younger days, when there was plenty of time on my part, the ability to sell my parents on the idea of taking me to the field depended on their time. Later, as girls, military service, girls, education, girl, business and family came on the scene, the time available for flying became even shorter. Now that I'm a retired gentleman of leisure, time is supposed to weigh heavily, but there seems to be even less of it than ever.*

Occasionally slipping in a little building time is a lot easier than getting to the flying field because it's so easy to step into the shop and work for a while. If it were that easy to step onto the flying field for a few minutes, wouldn't that be great? Well, if there's a park, a schoolyard, or even a fair-size unfenced yard in the neighborhood, the Minnwatt can provide that kind of convenient flying—and at a very low cost!

So far, Minnwatt has been flown mostly from a schoolyard (half a block away), but I've also flown it in three parks, two recreation centers, the front yard (quite often) and three flying fields. It's almost silent, so it seems to disturb no one. This is not high-tech flying, but the easy, relaxing kind that can recharge your batteries while the Minnwatt discharges its.

Minnwatt

BY RANDY RANDOLPH

Helen Randolph launches the Minnwatt for a front-yard flight.

by RANDY RANDOLPH

A MINI ELECTRIC FOR SCHOOLYARD FLYING

SPECIFICATIONS
Wingspan: 51 in.
Wing area: 330 sq. in.
Aspect ratio: 7.85
Wing loading: 7 oz. per sq. ft.
Nose moment: 17 percent of fuselage length
Tail moment: 40 percent of fuselage length

• Average flight time on a fully charged 5-cell 600mAh battery: about 5½ to 6 minutes (without thermal help).

Flying the Minnwatt

Before attempting to fly, charge the battery fully, turn on the motor, and check the control surfaces and trims. Make a wings-level launch (as you'd throw a ball to a young friend 50 feet away). Climb at a gentle angle to a comfortable altitude, and make any trim adjustments that might be necessary.

Loops from level flight are nice and round, stalls are very gentle and straight ahead, rolls are not the best, but are recognizable. The climb angle doesn't look steep, but the Minnwatt can gain enough altitude to become a very small speck in the sky. If a climb-and-glide pattern is followed, flights can be for as long as you can find lift.

RELAXING ELECTRIC FLIER

The heart of this airplane is a 36W or 50W motor and a small, low-cost battery pack. A battery eliminator circuit (BEC) allows the radio to use the same battery pack as the motor and eliminates the extra weight of receiver batteries. A 20-minute charge on its 5-cell 600mAh battery pack will usually provide a full 6 minutes of fooling around. Or, if long flights are what you want, you can climb to the limits of vision and fly for as long as you can find lift (and on cool evenings, lift seems to be everywhere). The BEC turns the motor off while there's still enough battery power to fly the airplane as a glider for quite a while.

The 50W motor is what makes Minnwatt the economical, good flying airplane that it is. The one used in the original is a replacement part for the Nikko Sky Ace. Order part numbers 15007 (motor), R15001 (three propellers) and R5002 (drive shafts) from Nikko America, 2801 Summit Ave., Plano, TX 75074; (800) 776-4556. The total cost will be less than $30! The Graupner Speed 400 and the Mini Olympus, both from Hobby Lobby*, are good replacements for the Nikko.

WING CONSTRUCTION

Wings usually require the most construction, so that's a good place to start.

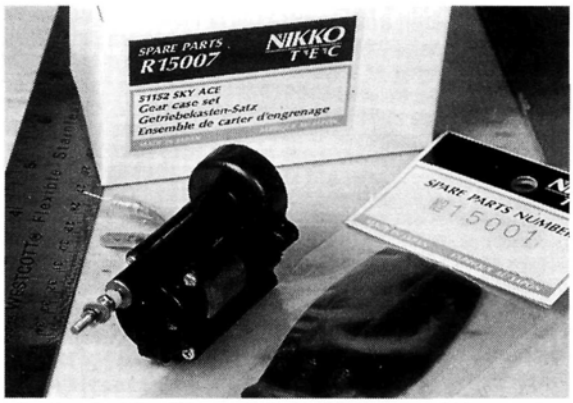
The ribs are all made of 1/16-inch-thick sheet balsa. They can be cut out of a printed sheet (made by tracing around a card-stock template with a fiber-tip pen), or they can all be cut at the same time by stacking balsa blanks together, tracing the rib pattern on the top one and sawing them out with a band saw or a jigsaw. If you use the printed-sheet method, the ribs should be stacked, pinned together and "gang-sanded" to smooth out any high or low places that crept in during the slicing.

Select four ribs for the center section, and trim 1/16 inch off the top and bottom of each to allow for the sheeting. Cut the webs out of 1/16-inch sheet, making sure that the grain is vertical. Webs add greatly to the strength of the spars, but add little weight. You could buy spars, but I prefer to strip them out of the appropriate sheet wood. You can do it with a straightedge and a razor knife, but it's easiest to use a balsa stripper.

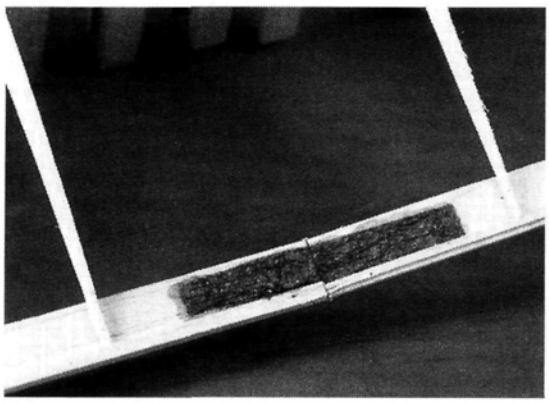
The choice of wood depends on its use. The wing spars should be cut out of firm stock; the leading edge can be slightly softer. The trailing-edge sheet is medium-weight quarter-grain stock. Slice the tip pieces out of soft, 1/8-inch-thick sheet. Use the plan templates to trim the main spars to the dihedral and polyhedral angles.

Cover the plan with wax paper, and start by pinning the bottom main spars into place on the plan. Slip some ribs onto the spar, and use them to position the trailing-edge sheet, matching the direction of the grain with that shown on the plan. Pin the trailing edge into place and, starting with the trimmed center rib, glue the ribs and webs into position. When you install the center rib and the polyhedral rib, use the templates to trim the webs to the proper angle so that the ribs will be slanted for the dihedral.

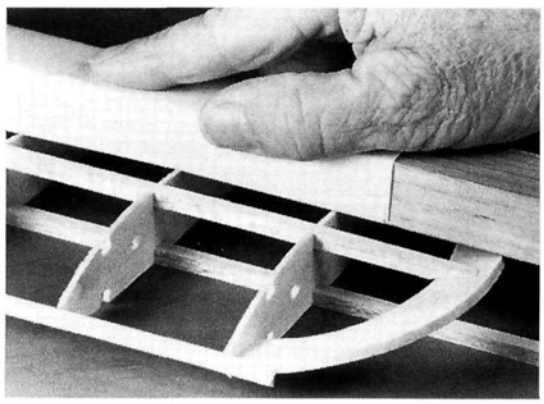
When all the ribs and webs have been installed, add the leading edges and the top main spars. The top spar should extend a couple of inches beyond the tip rib. Glue the spar to all the webs as well as to the ribs. Do not add the top trailing-edge sheet yet; install it after both wing panels have been joined at the dihedral joints. Build the other wing half in the same way.



The heart of the Minnwatt is its 50W motor. This one is a replacement part for Nikko's Electric Sky Ace ARF. Any motor in the 35W to 50W range with a 5-cell pack provides just the right amount of power.



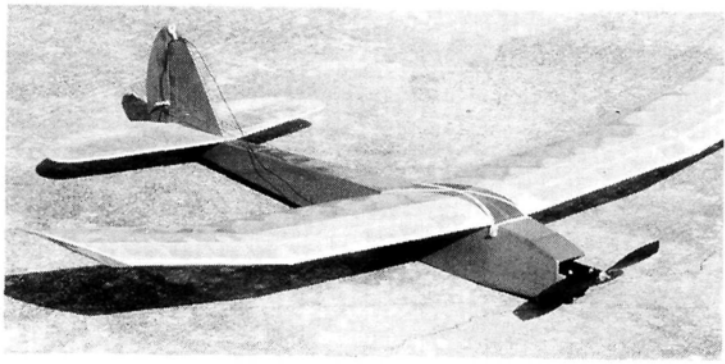
A small strip of carbon-fiber cloth between the top and bottom trailing-edge sheet at the dihedral braces doesn't show and considerably increases the strength of the joints.



To sand the tips flush with the top of the wing, use a sanding block that's partially covered with bond paper. Scrap 3/16-inch-square balsa fills the space between the bottom spar and the tip.

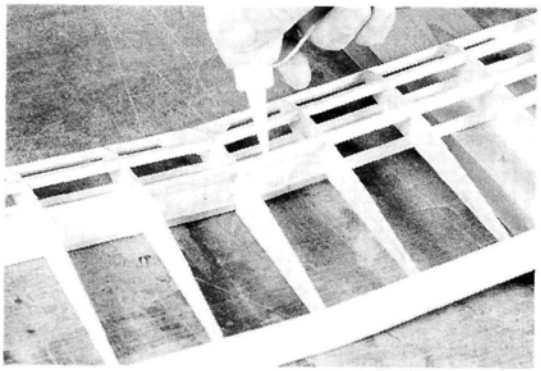
MINNGLOW?

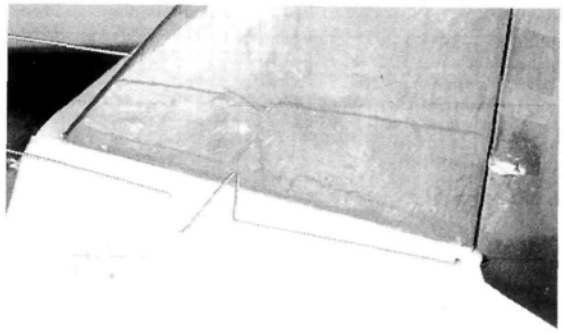
If you have a Cox Baby Bee or Black Widow .049 engine in your stable, you could easily build the Minnwatt to fly on glow power. Simply eliminate the hole in the firewall that would usually provide clearance for the electric motor. Mount the firewall 1 inch forward, and mount the .049 in place of the electric motor.



When both wing panels are complete, slice the dihedral braces out of 1/32-inch-thick plywood. Use a sharp razor to slice 1/32 inch off the polyhedral ribs on each side of the main spars to fit the plywood dihedral braces. Place one panel flat on the bench, elevate the other to the polyhedral angle, and glue the braces on either side of both spars. (Clothespins make good clamps for this.) Add the polyhedral to the other wing half in the same way, making sure that the angles are the same.

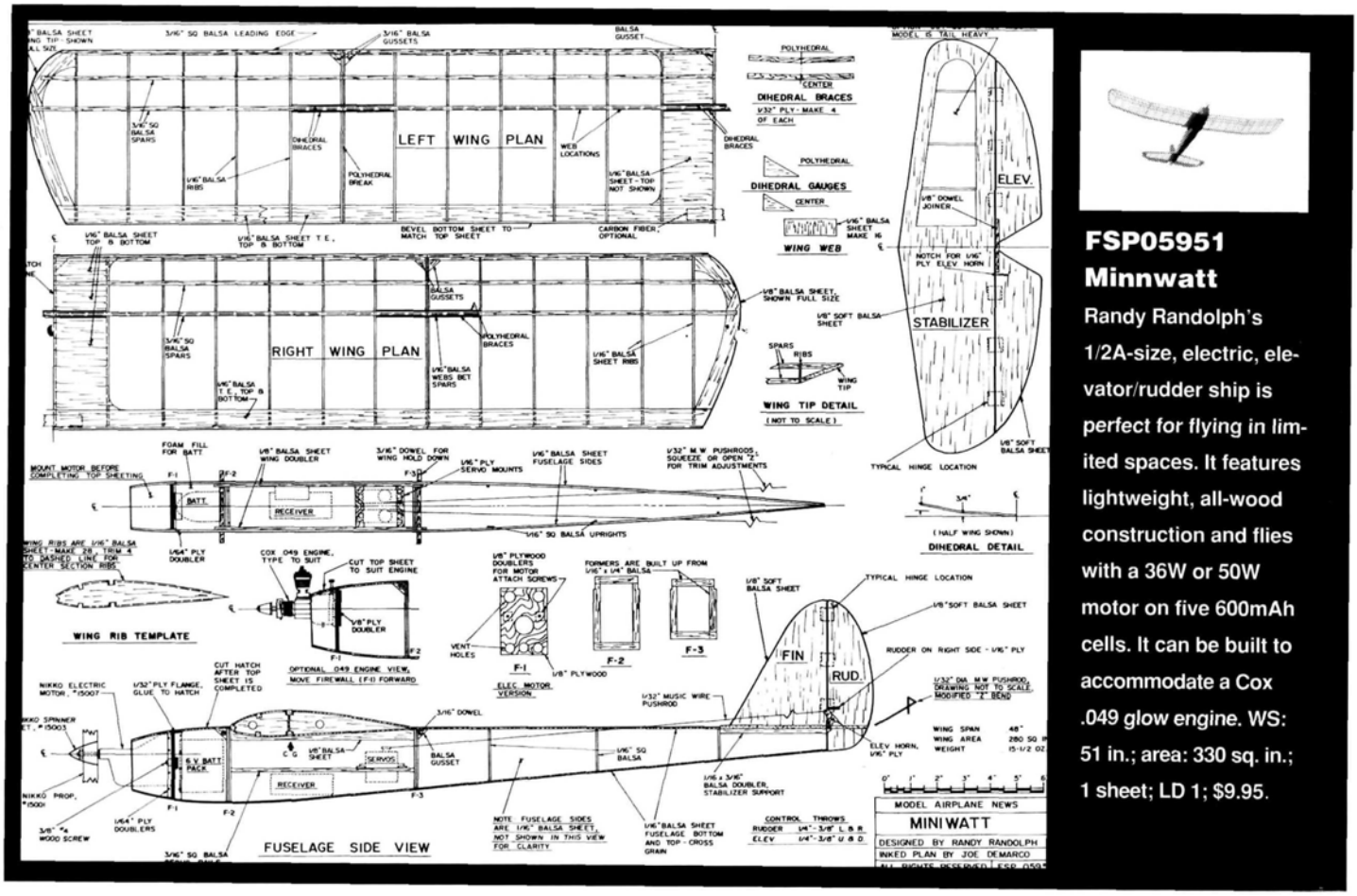
The tips are glued to the two tip ribs; notice that they slant upward to become flush with the top of the top spar stubs. Use scrap spar material as filler between the bottom main spars and the tips. When the tips are complete, join both wing panels at the center dihedral angle just as you did with the polyhedral joints. Add the top trailing edges and both leading-edge spars, then sheet the center section. Notice that the sheet goes *between* the spars rather than over them. Sand the completed wing.





Right: it's easier—and much more accurate—to add the polyhedral joints to both wing panels before you join them at the center. Notice the double ribs at each dihedral break.

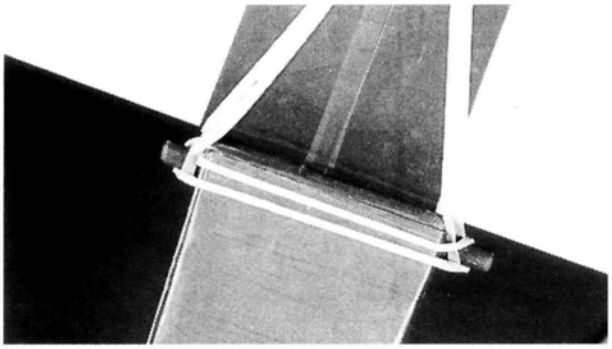
Far right: the music-wire pushrods are anchored at the servos as well as the horns, so the use of W-bends allows for any trim adjustments that might be necessary. This system works well for airplanes with light control loads.

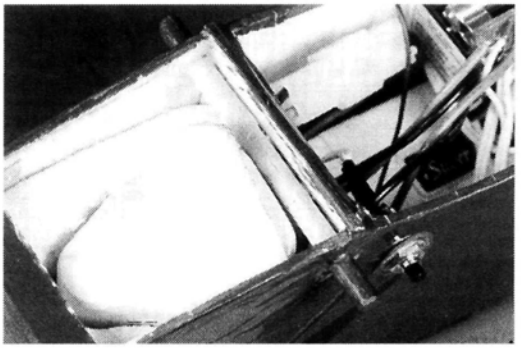


FSP05951
Minnwatt

Randy Randolph's 1/2A-size, electric, elevator/rudder ship is perfect for flying in limited spaces. It features lightweight, all-wood construction and flies with a 36W or 50W motor on five 600mAh cells. It can be built to accommodate a Cox .049 glow engine. WS: 51 in.; area: 330 sq. in.; 1 sheet; LD 1; $9.95.

ORDER THE FULL-SIZE PLAN...SEE PILOTS' MART, PAGE 134.





Left: the battery compartment in front of the wing is padded at the top and bottom with Styrofoam. A masking-tape tab is attached to the top of the battery and is used to pull it out for recharging.

Far left: a rubber band between the two, front, wing-mount dowels holds the battery compartment cover in place during flight—simple and effective.

TAIL FEATHERS

Slice the stab, elevator and rudder out of lightweight, 1/8-inch-thick balsa sheet. Notch the center of the elevator's leading edge, and glue the 1/8-inch dowel carry-through into place. It's easier to do this before you cut rudder clearance out of the trailing edge. When the fin and the stab surfaces are complete, join the mating surfaces and sand the outlines to match. (Note: if the airplane is tail-heavy, you can lighten the assembly by cutting out the center of the stab and adding 1/16x1/8-inch ribs.)

FUSELAGE

The fuselage sides are cut out of medium, 1/16-inch-thick balsa sheet. Don't cut the wing saddle out of the sides until you've glued the saddle doublers into place. The doublers are also 1/16-inch-thick balsa. Glue the 1/64-inch-thick plywood doublers in the firewall area and the 1/16x3/16-inch doublers at the stab mount. Then pin the two sides together, and sand them so that their outlines match. While they're still pinned together, cut out the wing saddle and drill the 3/16-inch-diameter holes for the wing-holding dowels.

Separate the sides and add the 1/16-inch-square uprights as well as the servo-mounting rails. Cut out the 1/8-inch-thick plywood firewall, and drill it for the motor mount. Add the two 1/8-inch-thick-plywood screw-backup plates; then build up the two cabin formers using 1/16x1/4-inch hard-balsa strips. Start to assemble the fuselage by gluing the two cabin formers into place on one of the sides. Be sure that the formers are perpendicular to the side by checking them with a right-angle triangle. When the glue has dried, glue the other fuselage side to the formers, making sure that it's perfectly aligned with the first. Bring the tail together and glue; when the glue is dry, glue the firewall into place.

Sheet the bottom of the fuselage with 1/16-inch balsa (the grain should run *across* the fuselage). Mount the motor on the firewall with 3/8-inch-long no. 4 wood screws, and run the wires through the bottom of the firewall and into the cabin area. Finish the cross-grain sheeting and sand.

FINISHING

I covered the original Minnwatt with MonoKote*, and I recommend it. Hinges made of covering material work well, but use the hinging method with which you're most familiar. The control horns can be cut out of 1/16-inch-thick plywood and notched into the surfaces as shown, or you can use commercial horns.

Cut out the hatch behind the firewall, and add the 1/32-inch-thick plywood flange. The flange holds the front of the hatch cover in place, and a small rubber band between the front wing-mount dowels holds the rear. Cut a piece of foam to fit the bottom of the hatch, notching it so that the motor wires can be passed through. Glue the foam onto the hatch floor with white glue. Cut a 1/2-inch-thick piece of foam to fit around the battery pack; glue it near the top of the hatch.

Trim the covering away from the stab where it contacts the fuselage on the bottom and the rudder on the top. Glue the fin and rudder to the top of the stab, checking their alignment with a square; then glue the stab onto the fuselage. Trim the covering away, and glue the 3/16-inch-diameter wing-mounting dowels into place. Check for, and eliminate, any warps that might have developed.

Before installing the radio, assemble the airplane and check the balance point. Move the servos around until the airplane balances at the point indicated on the plans, then install them to maintain this balance. Connect the elevator and rudder to the servos with 1/32-inch-diameter music-wire pushrods. The servo ends are Z-bends, which you should modify as shown to connect them to the control horns. The W-bends are used for adjustment and trim.

Route the motor connections into the cabin area, and connect the BEC unit and its switches to the receiver. Bring the battery connector into the hatch area and connect the battery. Push the connectors back into the cabin area, and slip the battery into its nest. Prop the motor, and check all the control movement while the motor is running, and if everything is in order, head for the park!

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

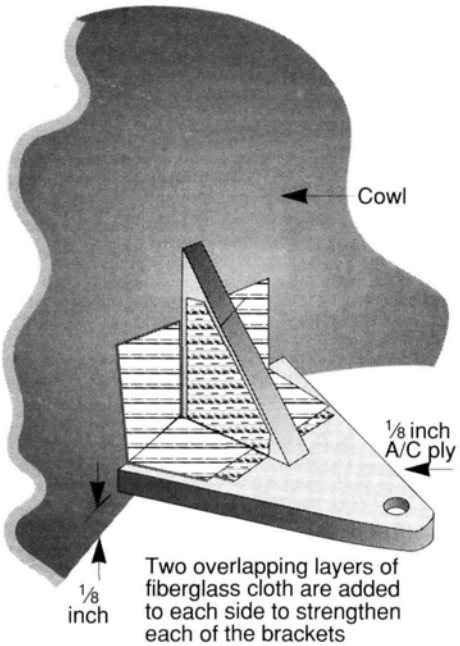
HOW TO

Hidden, strong and quick

Make Easy Cowl Mounts

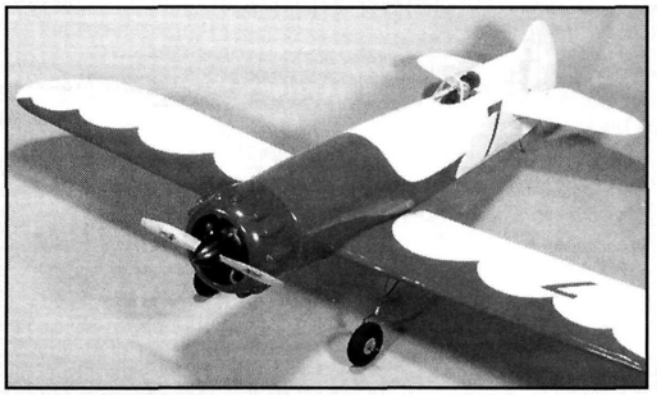
by GERRY YARRISH

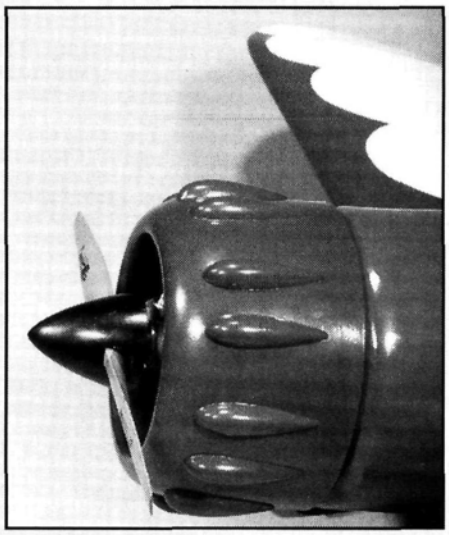
ONE OF THE most annoying problems modelers have to deal with when attaching a radial cowl is that, sooner or later, the external mounting screws wear and eventually crack the screw holes. The visibility of the screw heads also presents a cosmetic problem. Here's an easy way to eliminate these problems and simplify cowl attachment.



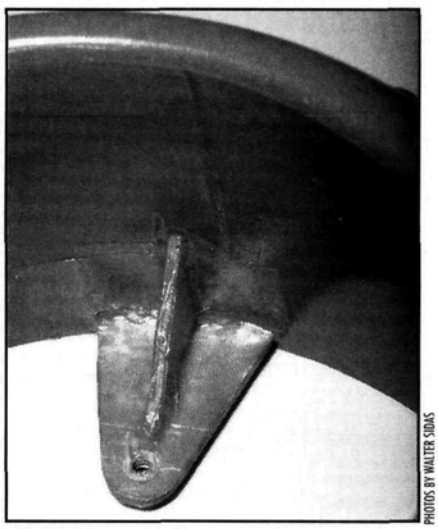
Two overlapping layers of fiberglass cloth are added to each side to strengthen each of the brackets

When I began my latest project—the Gentle Gee Bee (Model Airplane News plan FSP12941)—I already had a cowl waiting for a suitable airframe to be built behind it. The plans didn't show how to install the cowl, so I devised my own simple solution. You can adapt this method to other models that require a radial cowl.



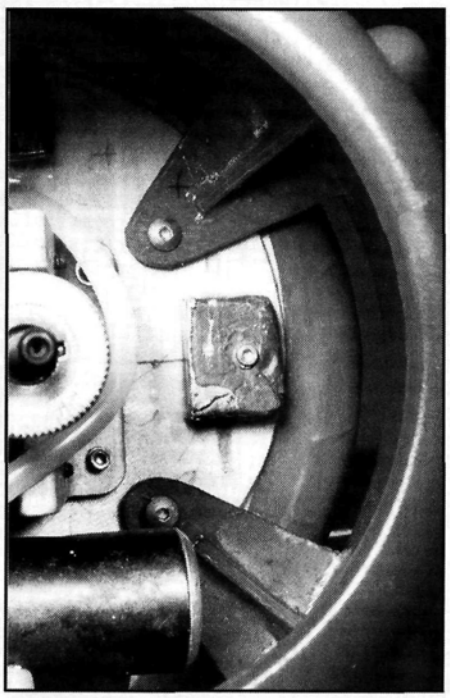


Here's the radial cowl that I used on my Henry Haffke-designed, sort-a-scale Gee Bee. Notice the clean appearance—no visible attachment screws to spoil its lines. Scratch-built from Model Airplane News plans, the Gee Bee uses a plastic, 1/6-scale, Pica* Waco biplane cowl.



PHOTOS BY WALTER SIDAS

The secret lies within! These simple plywood mounting brackets allow the finished cowl to be screwed directly to the firewall's face. I used 1/8-inch-thick AC plywood to form the "T" cross-section bracket, and I glued the two pieces that make up each bracket with thick Balsa USA* Gold CA. For a super-strong bond to the plastic cowl, I applied two overlapping layers of fiberglass cloth. The glass is applied with thin CA and "kicked" with accelerator. When they've been glued into position, the brackets are sealed to fuelproof the wood grain. For an 8-inch-diameter cowl, I've found that four brackets set 90 degrees apart work well. A smaller cowl could use three brackets, and a giant-scale cowl could use six, eight or even 10 brackets.



Here you see how easy it is to install the cowl. I simply screw it into place using Du-Bro* socket-head screws. To reach the screws through the open front of the cowl, you'll need a long ball-end Allen wrench. There's plenty of space for the brackets to clear items such as the muffler, the engine, the throttle linkage, etc. Because the long Allen wrench can easily reach between the cylinder heads, this system could also be used even if you have a dummy radial engine in the front of the cowl.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

OHIO R/C MODELS

The author's son, David, prepares the Ultimate for another flight.

by JIM ONORATO

A giant-scale aerobatic bipe with unlimited performance

Ultimate 10-300S

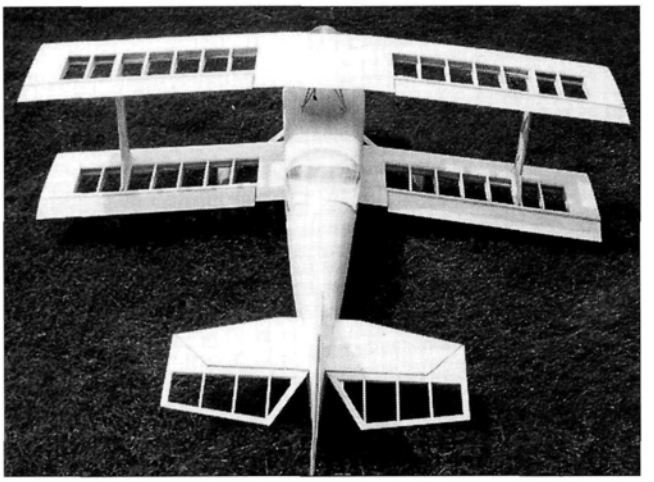
THE ULTIMATE biplane was conceived by Ultimate Aircraft (a division of Ultimate Aerobatics Ltd.) as an affordable, home-built, all-out-aerobatic biplane. The company was based in Ontario, Canada, and produced three Ultimates: the 10-100, the 10-200 and the 10-300S—with 100, 200 and 300hp engines, respectively. The "S" is a factory designation for aircraft that were constructed for demonstrations. The 10-300 is the best known of the series and has often been photographed in the Labatt's Blue color scheme. To the best of my knowledge, only one 10-300 was built. A two-seat version—the 20-300—was planned, but the company went out of business.

The Ultimate 10-300S from Ohio R/C Models* is a 28-percent-scale model, and it's capable of performing all the more aggressive maneuvers. The model is very stable, and it has good slow-flight characteristics. It isn't, however, a beginner's airplane.

THE ULTIMATE KIT

The kit comes in a large, plain, cardboard box that belies the excellence of its contents. The moment I opened the box, I could tell this was a high-quality kit. It includes a complete hardware package, high-grade fiberglass cowl and wheel pants, formed-aluminum gear, a tail-wheel assembly and a crystal-clear canopy. The wood is hand-selected, and all the fuselage formers, wing ribs and tail parts have been precision machine-cut. Two rolled, full-size sheets of plans and a step-by-step instruction manual are also provided. The instruction manual doesn't include any photos or illustrations, but it's easy to follow, and it

PHOTOS BY JIM ONORATO & WALTER SIDAS



The bare bones of the Ohio R/C Models Ultimate 10-300S; construction is light and very strong—a pleasure to build.

contains a complete parts list. There's also a list of items that are needed but aren't supplied.

CONSTRUCTION

For most of the construction, I used Pacer Technology's* Zap, Zap-A-Gap and Slo-Zap CA adhesives and Zip Kicker accelerator. Although all Ohio R/C's prototypes were built exclusively with CA-type glues, I decided to use Pacer's 5- and 30-minute Z-Poxys to attach the firewall, landing-gear blocks, cabane bearers and other hardwood parts.

WINGS

As instructed, I planned my aileron servo wiring before beginning wing construction. As with Ohio R/C's prototypes, I used one standard servo for each aileron, and I mounted them out in the wing bays directly in front of the aileron control horns. The top-wing servo leads and the bottom-wing servo leads would be connected to Y-harnesses and have a single lead coming out of the center of each wing. Before I started building, I laid out the servo-wire locations on the plan and cut holes in the ribs for the wires.

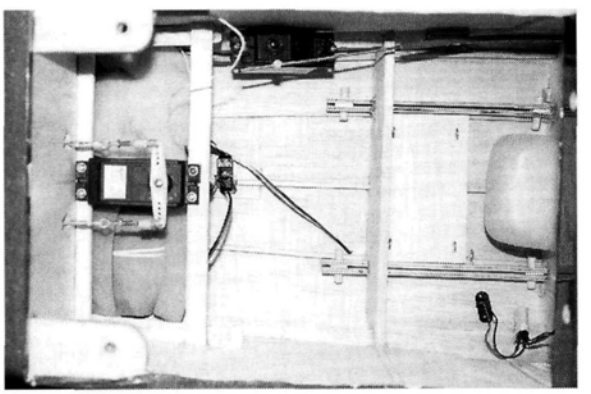
I built the wings according to the instructions—directly over the plan using standard construction practices. The top and bottom wings are very similar except for the parts that are associated with the mounting of the cabane and interplane struts. The ribs are machine-cut and marked on top with a red marker so that you don't put any ribs in upside-down. The wings have a very thin, symmetrical, low-drag airfoil and were built without any washout. They have a constant chord with "pinched tips"; that is, the tips have the same chord, but are thinner. There's no dihedral in either wing, and both wings are swept back.

The wings are made out of balsa ribs and two ¼-inch-square hardwood spars that are joined with 1/16-inch-thick balsa shear webs. They have 1/16-inch-thick balsa sheeting on the leading edge, the trailing edge and the center section. I followed the step-by-step instructions carefully, and to ensure a strong, straight structure, I installed the leading-edge sheeting as shown on the plans. I didn't install ribs 4 and 5 or the strut mount until after I had sheeted the wing. I built the ailerons as part of the wing, and then I cut them loose for final construction.

The only time I deviated from the instructions was when I tapered the hardwood spars at the tips rather than bending them to meet the tip rib.

TAIL FEATHERS

The fin, rudder, stabilizer and elevators were also built directly over the plan. I assembled the frames of the stab and the fin with ¼-inch-thick balsa and sheeted them with 1/16-inch-thick balsa. The elevators and rudder, which were not sheeted, were assembled out of ⅜-inch-thick balsa stock—except for the trailing edges, which were ¼ inch thick. This allowed the control surfaces to be tapered from ⅜ to ¼ inch for a more pleasing outline. During assembly, I used 1/16-inch-thick scraps to block up the trailing edges so they could be glued to the center of the framework.



The fuselage is huge, so there's plenty of space for any radio setup. Here you see the rudder servo with its pull/pull linkage and the throttle servo, which is almost lost in the area provided.

FUSELAGE

The fuselage is rather easy to build because the sheeting has no compound curves; it's built with balsa, spruce and plywood, and all its formers are beautifully machine-cut. The plans show the rudder and elevator servos mounted on the rear of the fuselage. I chose to put two standard-size servos in the

SPECIFICATIONS

Model name: Ultimate 10-300S
Type: high-performance aerobatic biplane
Manufacturer: Ohio R/C Models
List price: $359
Wingspan: 62 in.
Wing area: 1,300 sq. in.
Weight: 16 lb., 4 oz.
Wing loading: 28.8 oz./sq. ft.
Airfoil type: symmetrical
Length: 63 in.
Engine used: Brison Aircraft 2.4 2-stroke gasoline engine
Engine range: 1.6 to 3.2 2-stroke; 1.8 to 3.0 4-stroke
Prop used: Top Flite Power Point 18x6/10 and Dynathrust 18x8
Radio used: Futaba* 7UAFS transmitter, DAD Interceptor 2000 receiver and eight servos
Muffler: Slimline no. 2110C
Optional accessories used: Tru-Turn 4-inch aluminum spinner, 24-ounce Du-Bro* fuel tank, Du-Bro Kwik-Fill fueler, 3¼-inch Great Planes wheels, ¼-scale D.G.A. Designs* pilot, Ohio R/C engine mount.

Features: built-up balsa-and-ply construction. All airframe components should be built flat over the plans using conventional techniques. The kit includes a complete hardware package, high-grade fiberglass cowl and wheel pants, formed-aluminum gear, tail-wheel assembly and crystal-clear canopy. The wood is hand-selected and all fuselage formers, wing ribs and tail parts are precision machine-cut. Two rolled sheets of full-size plans and a step-by-step instruction manual are provided.

Hits
- High-quality fiberglass cowl and wheel pants.
- High-quality materials and machine-cut parts.
- Well-written, step-by-step instruction manual.
- Complete hardware package.
- Excellent flight performance.

Misses
- Insufficient stripwood provided.
- One page of instruction manual was missing.

FLIGHT PERFORMANCE

• Takeoff and landing

By the time I had resolved my interference problem, cold weather had settled into the Northeast, and our normally smooth grass field was quite bumpy. This made taxiing a bit tricky because the tail kept bouncing, and I was concerned that the Ultimate would nose-over before it got going. As suggested in the instructions, I placed an ⅛-inch shim under the rear of the landing gear to kick the wheels forward, but taxiing was still pretty touchy.

I had to hold full up-elevator while I slowly advanced the throttle to get the plane lined up and ready to go. The Ultimate tracked as straight as an arrow with almost no right rudder. I gradually reduced the up-elevator, and when it attained flying speed, the Ultimate lifted smoothly into the air with its wings perfectly level.

Landings are easy because the plane can slow way down, and it remains stable at very low speeds. You really need, however, to set it down on all three wheels and carefully watch the roll-out or it will probably nose-over. Once it's on the ground, hold in full up-elevator for taxiing.

• Slow-speed performance

The Ultimate is smooth and predictable at low speeds. It has an extremely low stall speed, and its stalls are gentle and straight ahead; the plane almost stopped in midair before stalling. Control response was good at all speeds.

• High-speed performance

The Ultimate is a "go-where-you-point-it," high-speed airplane. It tracks extremely well and is a smooth and stable flier. I didn't observe any bad tendencies at high speeds, and the Brison engine really motivates the plane. Vertical performance is awesome.

• Aerobatics

The Ultimate is capable of doing the most aggressive maneuvers, and I'm sure it will do anything imaginable. I only wish my flying abilities were good enough to take full advantage of its capabilities. Axial rolls are "right now" and as if performed "on a wire." Snap rolls are so fast that it's hard to stop in just one revolution. When I put the model in knife-edge and hold full "up" rudder, the Ultimate easily climbs to a vertical attitude. I probably could have done a knife-edge loop, but I chickened out (maybe next time). Tailspins are a thing of beauty, and recovery is immediate.

What more can I say? The Ultimate is made for aerobatics, and it performs perfectly. I'm not disappointed!

rear for the elevators, but I used a ¼-scale servo in the cockpit area and a pull/pull system for the rudder. Whichever way you plan to go, before you begin construction, plan for your servo wires or pushrods by cutting clearance holes in formers F-3 and F-4. I also drilled holes for the outer Nyrod that I installed in the fuse for my receiver antenna. I laid the Nyrod out as far from the elevator servo wires as possible.

Before beginning the fuse, you must decide which engine you'll use so you can determine the thickness of the engine-mount spacer plate and whether the firewall has to be moved back a little to ensure proper spinner-to-cowl clearance. I used a Brison Aircraft* 2.4ci gasoline engine. Because there are so many possible engine setups, Ohio R/C doesn't include an engine-mount spacer in the kit. They do, however, manufacture engine mounts for many engines and were good enough to provide me with one designed for the Brison 2.4. It includes shock mounts; it positions the engine the proper distance from the firewall and adds the correct amount of right thrust (approximately 2 degrees). It makes a difficult job very easy.

The front of the fuselage is slightly rounded, so getting the fuselage sides to conform to the rounded shape while gluing can be tricky. Quick-grip clamps held things together nicely while the epoxy cured. I installed the fuel-tank floor and the F-2 former at the same time.

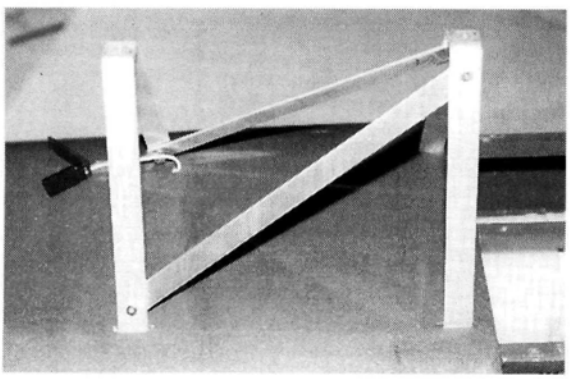
The instructions for reinforcing the firewall and the rest of the front end are not very detailed. Check the plans carefully, and be sure to install all the balsa and plywood reinforcing triangles throughout the front area. Although the instructions don't mention it, the 1-inch-long no. 4 screws that strengthen the front end are shown on the plans and are supplied in the hardware package. There are about a dozen, and they're very important!

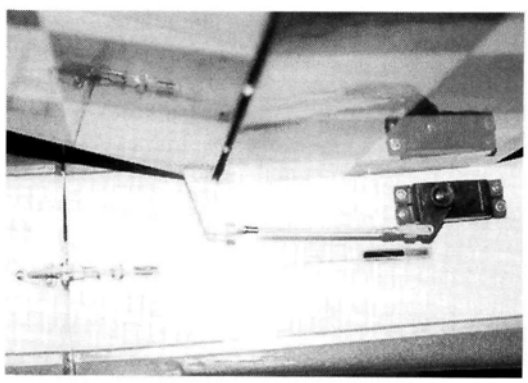
FINAL ASSEMBLY AND COVERING

Finally, I installed the cabanes and set up the top wing and struts. Follow the instructions carefully here to ensure that the wing's incidence is set at zero degrees.

I covered my plane with Coverite's* 21st Century film and was delighted with the results. This film shrinks more slowly than most, so it's absolutely necessary to follow the recommended iron temperature. As with any covering, the finished product is only as good as the surface preparation that precedes it. I used metallic-blue and lemon-yellow film with Great Planes* red and gold striping tapes for accent. The underside of the wings, stab and elevator were given a blue-and-yellow checkerboard scheme. I painted the cowl and wheel pants with matching colors of 21st Century spray paint, and I was again pleased with the results. The graphics were from Ohio R/C, and the Bluehawk decals came from Carl Goldberg Models*.

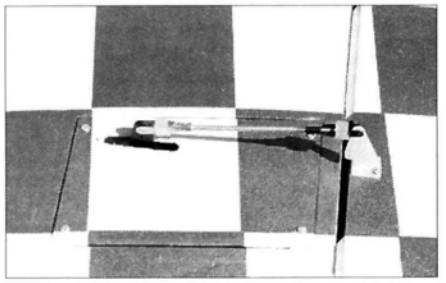
After I had finished the covering, I installed the landing gear, the wheel pants, the pilot, the canopy and the radio and then the ignition system and the Brison engine, which I equipped with a Slimline* giant-





Left: as is common with most Ohio R/C Models' designs, the plans show the servos mounted on the tail. I installed my twin elevator servos in the tail, but I relocated the rudder servo to the fuselage radio compartment.

Far left: the Ultimate's cabane mounts are made out of aluminum and fit into grooved plywood blocks that are built into the forward part of the fuselage—a very strong setup.



Each of the four ailerons has its own servo. I mounted them on the wings just forward of the aileron control horns.

scale muffler. After I had installed the cowl, I added the final touch—a beautiful aluminum Tru-Turn* 4-inch spinner.

FIRST FLIGHT

My first flight was a disaster. In my excitement to get this beautiful plane into the air, I forgot to do a range check with the engine running. This was my first experience with a capacitor-discharge (CD) ignition, and I was unaware of the potentially dangerous electrical "noise" it can generate. Unfortunately, the instructions that came with the Brison engine didn't mention this problem. Shortly after takeoff, the plane went completely out of control and ended up in some bushes just over a stone wall. Actually, the damage was much less than I had expected; only the left half of the lower wing and the bottom of the rudder were hurt. The rest of the plane was intact. Whew!

Bob Ankney of Ohio R/C was very helpful and sent me a new set of wing ribs, which I used to rebuild the lower wing. The plane was repaired in a few days, but I still had the interference problem to deal with. First, I completely separated from the radio everything that was connected with the ignition system. (Something I should have done in the first place!)

That still didn't help. I was convinced that the ignition system was faulty, so I asked Brison Aircraft to send me a new one. They not only sent me a replacement for the original system, but they also sent a competitor's brand (still no luck). With the antenna collapsed and the engine running, I couldn't get more than 20 feet away before losing control. To make a long, frustrating story short, after I had tried one more ignition system and three other receivers, I finally tried an 8-channel Design and Development* (DAD) Interceptor 2000 receiver, and everything worked just fine. As it turned out, all the ignition systems I had tried were fine. The problem was my receiver, which didn't have good noise rejection.

I'd like to thank Dave and Dan Abbe of DAD for sending me their receiver and Gary Allison of Brison Aircraft for his patience and support. I'd also like to thank Duarte Cabral of Cabral Systems Inc.* for the Pro-Spark electronic-advance ignition system that really performed well after I had installed the DAD receiver.

What I learned from all this is that no matter which radio equipment you use, even if it's top of the line, do a range check of your system with the engine at full throttle before you attempt to fly.

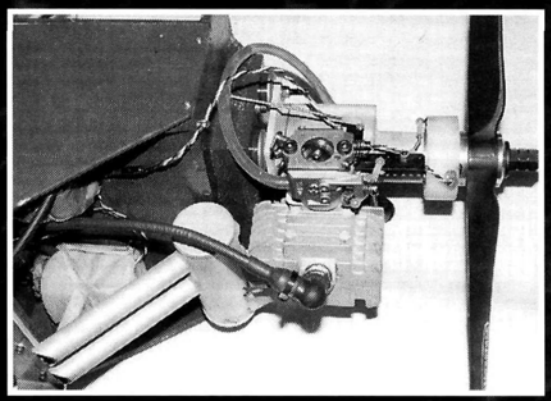
Ohio R/C's Ultimate 10-300S is a fine-looking, high-performance biplane that flies beautifully. The kit is complete and has high-quality materials throughout. The plans and instruction book are very well done and guide the builder every step of the way. If you're looking for something to burn up the sky, you'll love the Ultimate Bipe. I highly recommend this kit for advanced modelers.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

Brison Aircraft 2.4ci Gasoline Engine

Brison Aircraft was founded by Gary Allison a few years ago, and it currently operates out of Dallas, TX. Its principal business is designing and manufacturing model aircraft engines for giant-scale aircraft. It also, however, manufactures ignition systems, repairs Dolmar-style engines and stocks a full line of replacement parts, including single-bolt prop adapters and six-bolt prop hubs.

The 2.4ci is the smallest of the Brison Aircraft engines. Brison also produces 3.2, 4.2 and 5.8ci single-cylinder engines and a 6.4ci twin. All engines come with: CD ignition, throttle-coupled spark advance, single-bolt cantilever crankshaft, high-quality German ball and needle bearings throughout and an engine mount and pump-type carburetor. A muffler that's drilled and tapped for smoke is optional. All engines come with a one-year warranty on parts and labor.



Here is a detailed photo of how the engine is mounted. The Brison 2.4ci gas engine runs the Ultimate with power to spare; notice the Slimline Pitts-style muffler.

Each engine is tested and tuned before it's shipped, and each ignition system is engine-tested for reliability and checked to ensure minimal radio frequency interference. The engines come ready to fly, so bench running isn't required. The 2.4ci engine weighs 2.75 pounds and delivers 21 pounds of thrust. Suggested prop sizes are: 18x8, 18x10 and 18x6/10. The 2.4 runs on regular gasoline—leaded or unleaded—with a good-quality 2-stroke oil. I use Klotz* BIA 300 oil mixed in a 100:1 ratio of fuel to oil.

The engine is extremely easy to start by hand. I use a giant chicken stick and the following procedure:

- **turn on the ignition switch;**
- **close the choke and flip the prop three or four times until the engine fires;**
- **open the choke (it won't continue to run with the choke closed), and continue to flip the prop counterclockwise.**

The engine usually starts after three or four more flips and ticks over at a fast idle. I ran the engine with both a Top Flite* 18x6/10 wooden prop and a Dynathrust* 18x8 reinforced-nylon prop. The 2.4 ran smoothly from 7,200 to 7,500rpm, but it was pretty rough on the low end. Throttle response was excellent, and I didn't experience any hesitation as it went from idle to full throttle. Using a no. 2110C Slimline giant-scale muffler, the engine registers 98dB at 9 feet. The 2.4ci Brison Aircraft engine turned out to be a perfect match for the Ohio R/C Ultimate, and I was pleased with its performance. It never skipped a beat!

FIELD & BENCH REVIEW

by FRANK PONTERI

Editor's note: Part 1 (March '95) and Part 2 (April '95) of the Byron Originals AT-6 Texan "Field & Bench Review" covered the major kit construction and engine installation details. In this third part, the author details the plane's completion and flight performance. We've also included a "Reader's Report" from noted scale modeler Chuck Fuller.*

PART 3 **BYRON**

AT-6 TEXAN

A FRIEND OF MINE primed the completed model with lacquer and painted it with urethane auto enamel. I used 1/64-inch chart tape to add panel lines to the wings and stab. This is a very easy way to add a little character to the model. After you've primed the model, lay out the panel-line locations with a soft pencil. Apply the chart tape over the lines, and spray another coat of primer over the surface. When the primer coat has dried, remove the tape, and "soften" the edges of the recessed panel lines with 600-grit sandpaper.

Wipe the model down with a tack cloth to remove any primer dust, and apply the color coat to complete the aircraft. 3M automotive masking tape is good for masking off the trim colors. This tape is available in various widths and two thicknesses. Blue tape is thinner and bends around curves easily, but yellow tape is best for masking straight lines. Look for this tape in the paint department of auto-supply stores.

FINISHING TOUCHES

All the vinyl graphics for this model were produced by Butch Andrews of Model Graphics*. The Byron 1/5-scale Air Force graphic on the tail of my Texan was copied from a patch that was produced by Byron a few years ago. If you choose to use these graphics, follow the instructions supplied with them for a bubble-free installation.

For the cockpit, I used a Vailly Aviation* 1/5-scale civilian pilot. Vailly offers a variety of scale pilot figures and will paint them to your specifications. Give 'em a try for your next scale project.

PHOTO BY CHUCK FULLER

Author Frank Ponteri with the completed Texan.

Chuck Fuller's Byron AT-6 on the wing. (See Reader's Report.)

Finishing tips and control setup

A close-up of my custom-made Byron Originals decal made by Model Graphics.

The finishing touch of any aircraft is in the spinner—or "nose art," as it is referred to by Tru-Turn*. You should use a Tru-Turn-3302-B, 3¼-inch conical spinner for the AT-6. When you order it, be sure to specify the engine size and brand you have installed in your aircraft. Tru-Turn also makes several adapter kits so that you can perfectly match their spinner to your engine's prop shaft.

RADIO INSTALLATION

I chose a JR Remote Control* 388S radio for my Byron Texan. I installed all the servos in the locations shown on the plans: two 4131 servos for the elevators (one for each half); two 4131s for the ailerons; one 605 for rudder; one 517 for throttle; and one 517 for the landing gear's retract valve. In a box under the hatch on the left side of the aircraft, I installed a JR combination charge jack and on/off switch. Except for the rudder and tail wheel, all the pushrods were installed according to the plans and with the material supplied. I installed two Du-Bro* ½-inch control horns for the rudder and used Du-Bro's pull/pull cables to connect the rudder to the servo I also used pull/pull cables for tailwheel steering. Power for the radio is supplied by an SR Batteries* 1500mAh, 4-cell, flat battery pack that fits nicely in the space provided.

SERVO TRAVELS

For your first flight, I recommend that you set your servo travel up according to the instructions and adjust it later to suit your own flying style. For the aileron and elevator controls, I set up the high-rate servo travel at ¾ inch in each direction for both the aileron and elevator controls and at 2 inches left and right for the rudder. For the first flight, I set my low rates for the elevator and aileron at ½ inch in each direction.

USING ADHESIVES

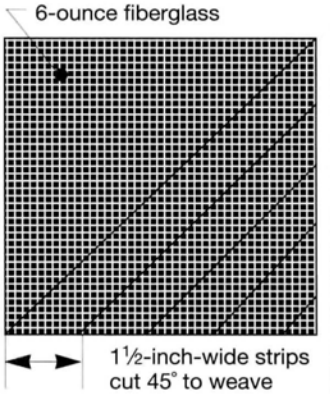
I've noticed that a number of first-time builders of Byron kits have basic questions about the types of adhesive that should be used to join various parts. Here, I summarize the types of adhesives and the techniques I use.

• **Plywood formers.** The Byron fiberglass fuselage is made of polyester resin. In my opinion, epoxy glue doesn't stick well to polyester, so the formers should all be glassed into place with polyester resin. Start installing the formers by trial-fitting them in their correct positions. They should fit snugly, but should not be so tight that they distort the shape of the fiberglass fuselage.

When you are happy with the formers' fit, remove them, sand the area inside the fuselage where they'll be installed, and then wipe the area clean with denatured alcohol. Put the formers back into the fuselage in the proper positions, and spot-glue with *a few small drops of* 5-minute epoxy. (Alternatively, you can insert a few small nails through the fiberglass to hold the formers in place; remove the nails when you've glassed them into place.)

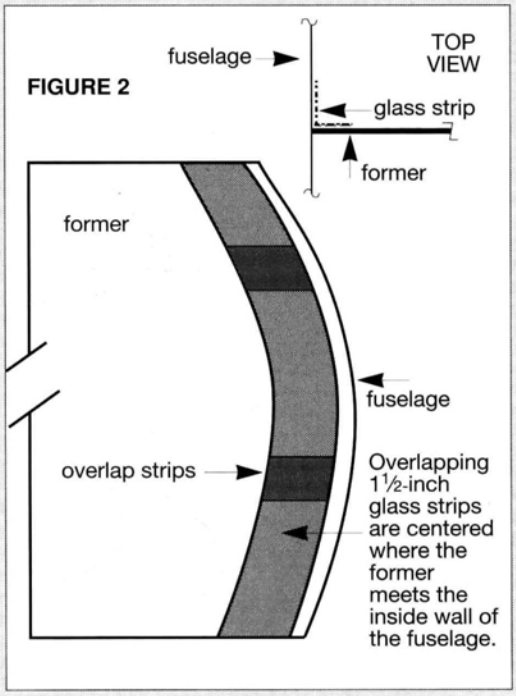
Cut 4x1½-inch strips of the 6-ounce fiberglass cloth that's supplied with the kit. Cut at a 45-degree angle to the weave (Figure 1). Mix 1 ounce of polyester resin and, using a flux brush, apply the resin to the fiberglass fuselage and the formers. Center the strips on the former and fuselage, and paint into place with the resin. The cloth will darken as it's saturated with resin (Figure 2).

FIGURE 1
How to cut fiberglass for strips



Most Byron aircraft, the AT-6 included, have two plywood formers that hold the aluminum wing attachments. These formers *must* be installed properly in the fuselage. If one loosens, the wing will depart the aircraft in flight. Follow the steps described in the manual, using the method described here to secure the formers.

FIGURE 2



• **Plastic trim parts.** Plastic parts such as air scoops and pushrod exit guides should be glued to the fuselage with PFM*. Sand the fuselage around the area before you attach the part. If the part is to be flared into the fuselage, use F&P* filler.

• **Foam-core wings and stabs.** These require a different set of adhesives because CA and polyester resin will attack foam. Before using any glue on foam, test it on a piece of scrap to ensure that the glue doesn't attack foam. Balsa wing skins can be attached with epoxy or one of the commercially available contact cements. Abell Hobby* contact cement works well for this. Many people use epoxy, but I find it too heavy and difficult to work with.

Balsa leading and trailing edges, tip blocks, and all the other balsa parts are attached to the foam cores with either 30-minute epoxy or Tite-Bond carpenters' wood glue.

• **Balsa and lite-ply.** I use Bob Smith Industries* CA for all balsa-to-balsa and balsa-to-lite-ply applications.

• **Epoxy tips.** Five-minute epoxy is very popular, but I use it less than any other type. I use Bob Smith Industries 5- and 30-minute epoxies along with the 2-hour, 20-minute and Finish Cure epoxies. The density of the parts to be joined determines the epoxy to be used. A hard wood requires a slow-curing epoxy. Slow curing allows enough time for the epoxy to "filter" into the wood grain. The Finish Cure works well to secure fiberglass tape to the wing center section. The 2-hour epoxy is also used to glass plywood to plywood when extra strength is needed.

FLIGHT PERFORMANCE

As I write this article, I'm looking out my window at a wintry, 28-degree Chicago day; it's snowing! Because I can't test-fly in this type of weather, I went to see my friend Tom Walker of Robart Mfg. to hear his remarks about flying the Byron AT-6. Tom and his Dad, Bob, have been flying a Byron Texan for some time, and they've provided a good evaluation of its flight performance.*

• Takeoff and climb-out

Ground tracking is very good owing to the landing gear's wide placement. Ease in the power, and apply right rudder as needed to overcome the effect of torque. After a few feet, the tail will come up, and you should continue to smoothly increase the power to about 80 percent. The airplane just flies off the ground. Continue to increase power to 100 percent through the first turn, and maintain 100-percent power until you reach cruise altitude. Then reduce power to 60 or 70 percent, and trim for straight and level flight. A touch of right rudder trim should be all that's required.

• Stalls/low-speed flight

Two basic maneuvers that should be done on all first flights are slow flight and power-off stalls. This will give you a feel for the aircraft's handling characteristics and prepare you for the first landing. If properly balanced, the AT-6 will have a very predictable stall without any snap-roll tendencies. Slow flight is easy and may require some right-rudder correction if power is being carried.

• Racing/high-speed flight

As a racing machine for the popular 101-inch T-6 class, the Byron AT-6 Texan has many first-, second- and third-place wins under its belt. It's also interesting to note that Byron originally designed the AT-6 as a giant-scale sport model—not a racer! That it does so well around the pylons speaks very well of the model's design and sturdiness.

Flying my Dad's model, I find it to be a good race plane. There's no noticeable trim change when the throttle is "firewalled," and turning the pylons is relatively easy. Depending on the model's flying weight (typically 25 to 32 pounds), maximum speed is in the neighborhood of 110 to 115mph. I like to fly a precise line around the course, so I use a bit more rudder than other racers. Many racers simply throw in aileron for a 90-degree bank and then pull their models around with elevator. Others will set up really high for the pylon and then bank over more than 90 degrees (maybe 100 to 110 degrees) to get a slingshot exit from the turn. How you fly your model is really up to you, but the Byron AT-6 won't do anything to surprise you—no high-speed snaps or anything like that. Just go fast and turn left!

• Aerobatics

In choosing the maneuvers you wish to execute, remember that the AT-6 was a military advanced-trainer aircraft and not an unlimited aerobatic aircraft. Scale loops are best made by applying full power as the nose is pulled up and then reducing it as the nose passes through inverted level at the top of the loop. Rolls are easy using coordinated rudder and aileron. Inverted flight requires some down-elevator application for straight and level flight.

• Landings

Begin the landing approach on the downwind leg, and reduce power to 60 percent. Hold the nose level, and allow some speed to bleed off. You'll notice that the aircraft may rise slightly when you put in full flaps; however, its nose won't pitch up. Lower the nose to maintain approach speed, and keep all turns flat and somewhat shallow; use rudder to help turn the aircraft. Fly the aircraft toward the end of the runway while maintaining power. As you approach the end of the runway, reduce the power slightly and begin the flare to straight and level. At an altitude of about 2 feet, reduce power to 30 percent, and maintain a level attitude until the wheels touch down. Only after you're down do you reduce power to idle. Don't try 3-point landings; wheel landings are best.

SPECIFICATIONS

Manufacturer: Byron Originals
Model name: AT-6 Texan
Type: 1/5-scale warbird
Wingspan: 101 in.
Length: 71.5 in.
Weight: 25 to 30 lb.
No. of channels: 6
(elevator, rudder, aileron, throttle, flaps and retracts)
Fuselage construction: fiberglass
Wing construction: foam-core
Power req'd: 3.7 to 4.2ci
Engine used: stock Zenoah G-62 (required for air races)
List price: $564.95 (kit only)

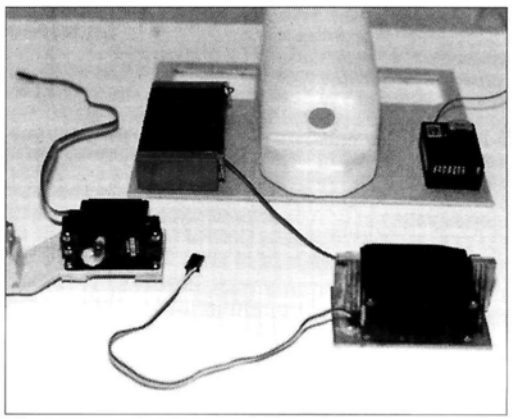
HITS

- The hardware package was more than adequate to build the model.
- The building sequence in the manual worked well, and the detail sheets had the additional information needed to complete the model.
- All of the parts supplied fit well.

MISSES

- The parts for the tail feathers all have to be made of balsa stock using the templates provided. I would expect factory-cut parts in a kit costing this much.
- A choice of canopies should be available.
- Hand-cut plywood parts in place of die-cut parts would be nice.

Comments: the Byron AT-6 is a good value for the time and money invested. This model has won a number of national air races, and it has been a favorite at many giant-scale fly-ins. It's recommended that you have some "big bird" building experience before building this kit. If this is your first giant-scale aircraft, get help with the building and flying.

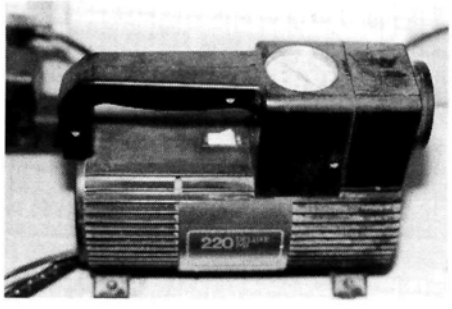


The main servo board that's supplied with the kit supports two elevator servos and the throttle and rudder servos, as well as the receiver, the battery and the fuel tank. The retract pneumatic-valve servo and the 1/4-scale flap servo are shown in the foreground.

WEIGHT AND BALANCE

The AT-6 doesn't like to be tail heavy, so it's critical that the CG be in the proper location. Drill a 1/8-inch-diameter hole in the outboard ribs of the wing's center section 5 3/4 inches from the leading edge. This hole should be drilled just below the wing cuff. Take two pieces of 1/8-inch-diameter music wire. Bend each to form a hook at one end and a 3/4-inch-diameter loop at the other. A 3/4-inch-diameter dowel will be passed through the loops and will serve as a handle to lift the model.

Place the hooked ends of the wires into the holes in the wing's center section, and slide the wing panels



A useful addition to your flight-box equipment is this portable, 12V air compressor with air gauge; it easily fills your retract air-supply tank.

READER'S REPORT

by CHUCK FULLER

Editor's note: active scale modeler Chuck Fuller built the AT-6 that's shown in flight on the opening page of this article.

I omitted flaps to keep the plane simple and light for giant-scale racing. My 28-pound plane used a Zenoah G-62. I created the plane's simulated polished-aluminum finish with trim MonoKote and polished-aluminum duct tape. Because this is a racer, I did not go into great detail when I constructed the landing gear and gear doors. I used Robart retracts, and they worked exceptionally well. Overall, I am pleased with the building and flying of this plane.

Flight performance: takeoff requires full power and minor rudder correction; even *I* did OK! I've found this plane to be capable of inverted flight, snap rolls, loops and anything else I could think of. I loved it and felt as if I were back in AT-6 training during WW II (yea, I was one of the lucky guys). Low-speed performance relates to wing loading and, at 28 pounds, my plane was very reliable at low speeds.

Hits: outstanding fiberglass fuselage and cowl parts; high-quality materials; accurately cut foam parts; complete instructions.

Misses: owing to pilot error, I missed pylon three at Madera, and the plane no longer exists.

into place (snugged up to the wire hooks). Put the model on the floor, stand over it, and lift it with the dowel handle. The model should balance slightly nose-down. If it doesn't, add as much weight as is necessary to the front former. My 28-pound model required 8 ounces of lead to balance properly.

I hope to see many of you at the IMAA Rally of Giants, which will be held on June 22 to 25 in Danville, VA. You'll be able to see this aircraft fly there. Until next time, remember, "Big is better!"

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

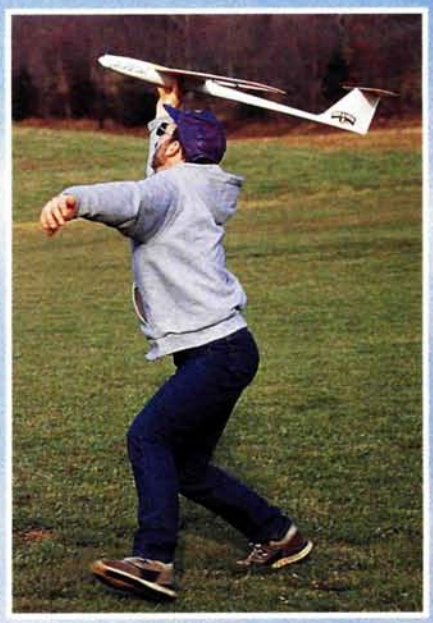
FIELD & BENCH REVIEW

STATE-OF-THE-ART, 2.2-METER, MOLDED ELECTRIC SAILPLANE

by DAVID C. BARON

AT THE 1994 KRC (Keystone Radio Control Club) Electric Fun Fly, I discovered this great airplane. I had the good fortune to park and set up my pit near Ed Slegers' booth. Ed's company, Slegers Intl.*, imports many first-class models from Europe. I immediately noted a series of exclusively electric aircraft called "Auras," which Slegers imports from Model Airplane Production (MAP) of France. The models in the series are denoted by the number that comes after the name.

The Aura 1 is small with a wingspan of only 1.5 meters (a bit under 60 inches). It reminded me of some of the electric pylon racers that I have seen, but I suspect that it is slightly too large for this use. The Aura 2 is a 7- to 10-cell competition ship. It has a wingspan of 1.92 meters (approximately 6 feet) with a substantial chord. The Aura 3 has a wingspan of 2.2 meters or 86 inches. Interestingly, the Aura 3 has the same wing area as the Aura 2. It was the higher aspect ratio that caught my eye. This is a very lean plane, and every joint between each surface is fitted and filleted. This is the kind of model that looks as if it is flying when it is standing still!



Russ Pribanic launches the Aura 3 at the FLYRC field in Southbury, CT.

PHOTOS BY WALTER SIDAS & DAVID C. BARON

MAP Aura 3

The author experimented with different powerplants. Here, an Aveox 1409/5 brushless motor is shown. Note the Aura's motor mount; it's pre-drilled to accept many European motors, so you must drill new ones to allow the use of many popular U.S. motors.

WING

The wing is one piece, which makes it a little awkward to transport, but this simple design is also remarkably light. It is hollow-molded of 10/10 Rohacell foam, and it has an oversize spar. There are holes for mounting each aileron servo out on the wing, close to the root of the aileron. You'll need to extend the leads of the aileron servos so that they reach the receiver comfortably. The servos are mounted between the leading edge and the main spar and, to fit them in this space, you'll have to grind off the mounting ears of the microservos. I had to force myself to do this step, because hacking up the cases of the servos leaves me feeling a bit awkward. I figure that someday I might have to return the servos to the manufacturer, and the technician will wonder what sort of ritualistic rite was performed on them!

After just a little sanding of the leading and trailing edges, the wing is complete. Take a moment to admire the carbon spar; it can handle some outrageous "Gs." I've tested the strength of the wing extensively; I regularly do outside loops from level flight that are about 200 feet in diameter. The plane is really "cooking" at the bottom of the loop, but you hardly see the wing flexing.

SPECIFICATIONS

Model name: Aura 3
Type: electric sailplane
Manufacturer: MAP (France); U.S. importer—Slegers Intl.
List price: $549
Wingspan: 86 in.
Length: 39 in.
Weight: 48 oz. (approx.)
No. of channels req'd: 4 (left and right ailerons, elevator, throttle)
Motors used: Aveox 1409/5; Astro Flight FAI 05
Prop used: Aeronaut 8x4.5 direct drive
Fuselage construction: epoxy/Kevlar with carbon reinforcement
Wing construction: hollow, molded 10/10 Rohacell; carbon-fiber spar

Hits

- Very strong, lightweight wing.
- Prefinished surfaces.
- The price of this model is excellent when you consider that it really is an ARF in a world where that term is used much too loosely.

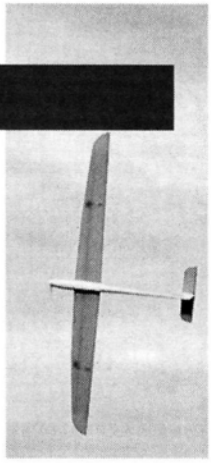
Misses

- All of my other gliders are now very boring.

FUSELAGE

The fuselage is made of epoxy/Kevlar with carbon reinforcement. It's very wide and well-suited to any battery pack you own. I fly my Aura 3 most often with 8- to 10-cell, 1700mAh packs. Even when the battery is in place, the fuselage is long and wide enough for all the rest of your gear. I use Velcro®-brand fastener to attach the speed control to the inside of the canopy area (this

Author Dave Baron holds the Aura 3—a 2.2-meter electric sailplane made by MAP of France and imported to the U.S. by Slegers Intl.



Takeoff and landing

Regarding the two motors that I've tested in this model, any hand-launch that has the front of the glider pointed toward the sky should be successful. On eight cells, the Aura 3 almost has the power to go vertical right out of your hand. The model does have the tendency to lift its nose when under full throttle, so expect to hold in some down-elevator, or program in a mix that displaces the elevator downward by a few degrees at the maximum power settings.

Landings are a breeze if you have a long runway or take the time to program in a spoiler command. I have an "air-brakes" mix set up on my radio; it sends both ailerons up to about 40 degrees while the elevator is deflected downward about 4 degrees. This results in a reasonable descent rate that bleeds off both altitude and speed without sacrificing the energy needed to flare.

Stalls

The Aura 3 is very predictable through the stall, regardless of which battery configuration I use. When I used the 8-cell, 1700mAh pack, I expected some deterioration, but I was pleased to find out that it stayed mild-mannered. The plane is so slippery that I have yet to get it to enter an accelerated stall.

Speed range

The Aura 3 looks faster than it really is. This is not to suggest that it isn't fast; it just isn't as fast as I had expected. It dashes from thermal to thermal with just a hint of down-trim, and slow flight is very good. Because it is so streamlined, some planning is needed to get it to slow down where you want it to and at the altitude that you desire.

Aerobatics

With only ailerons and elevator, you can't enter the Masters class with this plane. But as I've discovered, you can have a lot of fun with it. If you leave the aileron linkages unfaired, the plane gives off a satisfying whistle at high speed. This is especially neat when you're on the deck. It is an attention magnet for your maneuvers. I have considered cleaning up all those exposed linkages to reduce drag, but the noise has gotten such favorable remarks that I think that it will stay that way for a little longer.

As I stated earlier, my favorite maneuver is a tremendous dead-stick outside loop that starts from level flight, and the bottom of the loop is as close to the runway as you dare! Performing this dead-stick gives you a good idea of how fast the plane flies, particularly as it bottoms out and heads back up through the vertical. Rolls are conventional, but if you can configure your aileron differential for more axial rolls, it will be to the detriment of coordinated slow-flight control and thermalling performance. *[Editor's note: Slegers Intl. comments that the Aura 3 was designed to be a thermal-duration sailplane, not an aerobatic ship, although it can withstand the stresses of aerobatics.]*

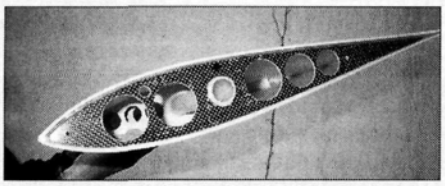
INSIDE MAP

MAP owner Jean Petignaud and his son hold the Adagio.

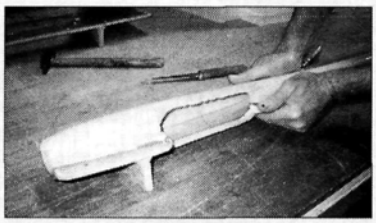
During a recent trip to Europe, I had the opportunity to see the Aura's production facility. My good friend and fellow journalist Guy Revel graciously arranged for me to visit MAP's production line. I must say that French hospitality was impressive. Guy picked me up at my hotel on the morning of my visit and acted as translator and guide the entire time that I was in Paris.

On arrival in the town of Pontoise, Guy introduced me to Jean Petignaud—the owner of MAP. Jean extended a warm welcome and provided a complete view of the construction of this incredible series of models. He molds many planes at once, and I quickly became aware that there were many more models there than just electric gliders. MAP offers scale gliders, competition gliders and pattern ships—all with the same level of quality and innovation as his Aura series. Another surprise was the discovery of another member in this series—the Aura 4. This 27-cell model is for the serious competitor!

An Aura 3 competition wing is lifted out of the mold. I discovered at the factory that there are two wing versions for each of the Aura series; one was built of Rohacell for competition, and the other used a foam-core for the sport modeler.



The root view of the wing on Jean Petignaud's electric pattern ship—the Adagio. This model is light and gorgeous! I hope that Ed Siegers will be importing this to America soon!



An Aura fuselage emerges from its mold at the MAP factory. The finish is flawless.

The Aura's hollow wing is molded of 10/10 Rohacell foam. The dark area of the wing is the oversize, carbon spar. Note that the aileron servos are mounted directly in-line with the control horns. The Aeronaut 8x4.5 folding prop provided impressive climbs with both motors.

is done through the wing saddle; the canopy is not removable). Make sure that you place the speed control up and out of the way of the battery pack in case a crash causes the battery to move forward. The receiver and airborne battery ride behind the motor and the battery. Again, I use Velcro®-brand fastener to keep them in place.

To say that this plane is rugged is an understatement. This design is outrageously strong, yet flexible and light. One friend of mine told me that during a botched landing, he cartwheeled his Aura down the runway. Most gliders *don't* cartwheel; they just break up because of the leverage that the wing has on the fuselage. The only damage to my friend's plane was some wrinkling in the wingtips! I can believe it; the model has the right balance of strength and flexibility, and this keeps it in one piece when the going gets rough.

POWERPLANT CHOICES

The metal motor mount is pre-installed and drilled for a wide variety of European motors. What I'm saying here is that you need to drill some new holes in it to mount an Astro Flight* or Aveox* brushless motor. The fittings for the wings are already mounted and complete. You must install your elevator servo in the tail. As with the aileron servos, this necessitates extending the servo's lead. I advocate making a permanent extension rather than one that plugs in. It would be a nightmare if the servo came unplugged in the narrow part of the body.

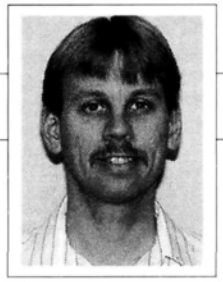
My first experiments to find the best powerplants for this model have involved the five-turn Astro Flight FAI 05 and an Aveox 1409/5. Both motors gave me rocket-like climbs when I used an Aeronaut* 8x4.5 prop direct drive. I've tinkered with batteries of many capacities in seven to eight cells. The Astro motor is smaller and lighter, and this may be enough to sway the modelers out there who count every ounce. I appreciated the Aveox's cool, clean operation. I get worried about heat buildup in an essentially closed fuselage.

HIGH-QUALITY FINISH

Not only are these models of the highest quality, but they are also beautiful. They are painted while in the mold, and this yields a beautiful, colorful finish that offers the lightest possible weight penalty. I have never achieved a finish this pretty, so I like this concept a lot! These designs were so complete that after installing the radio, servo and motor, you realize that it's time to charge your Ni-Cds and head for the field.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138* ■

CENTER ON LIFT



MICHAEL LACHOWSKI

WARM GROUND EQUALS LIFT

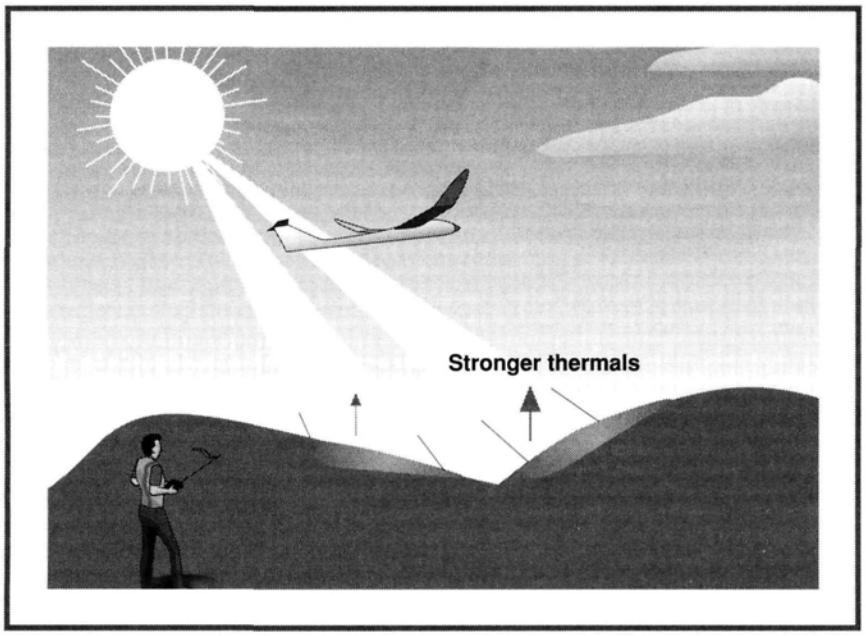
LET'S FLY. Winter weather sure cuts down on flight time for those of us in the northern hemisphere. Those reports on January's flying conditions in New Zealand can be depressing. With the spring weather, it's time to brush off the thermal soaring skills, so I'll talk about how the thermal gets its heat. Because your flying skills may be a little rusty, you should check out your model thoroughly after that less-than-perfect flight. Finally, for that rainy day, get out the VCR, and do some flying with Dave "Old Buzzard" Thornburg, or read the latest NSP* (Northeast Sailplane Products) catalogue.

SOLAR HEATING

The heated air in that elusive thermal gets its energy from the ground. Solar energy passes right through the atmosphere without warming the air, but it does warm the ground. Let's look at some conditions that affect solar heating.

Shadows from passing clouds will greatly reduce the heating of the ground. Areas that have been in shadow for some time are not a good place to look for thermals. The shadow has cut off much of the energy input to the ground. You can watch the clouds moving by and predict when areas will be in shadow or sunlight. If you're flying near the edge of a cloud shadow, fly toward an area that's still in sunlight. Another tactic is to maintain altitude until the shadow moves and the ground starts heating again.

Haze and smog also reduce ground heating. The best thermal soaring weather on the East Coast happens in the spring and fall during the cool, dry and clear skies of polar continental air from Canada. The hot, humid days in the summer provide only weak thermals. Usually there isn't much you can control here. All you can do is adjust your flying. Take advantage of light lift or low sink areas on hazy days. On clear days, which have stronger lift, you can be more aggressive in covering ground to reach thermals.



Hills facing the sun receive more direct heat and are more likely sources of thermals than hills sloping away from the sun. Don't forget the clouds that curtail or shut down thermal generation.

In a previous column, I mentioned the effect that terrain has on lift. The angle at which the sun's rays meet the ground determines how effectively they heat it. The more acute the angle, the less effective the rays. Latitude, the season, the time of day and the terrain determine the angle of the rays. A hill is best for soaring because the rays tend to strike the sunny side more directly. Soarers can take advantage of the temperature differentials between the sunny side and the side that's in shadow.

Solar heating is only one factor. In future columns, I'll talk about some others, such as surface characteristics, moisture, wind and trigger sources.

POST-FLIGHT INSPECTIONS

Not every flight or landing is perfect. For instance, during your spot landing, the plane may have hit the nail that holds the landing tape. Guess what? There is a crack on the nose now. Don't wait until the crash on your next flight; do a quick inspection.

You should always give your model a thorough check after a flight if you suspect there may be a problem. When should you check?—definitely after a hard launch, especially in lift. Did the wing bow more than usual? Were the wing and tail twisted out of position? Take a good look at the wing, and flex it to look for damage. I always check the ends of wing rods and the servos. Check the bottom of the stabilizer, too.

Flights in strong lift invite problems. While burning off excess altitude, it's easy to overstress an airframe. If you did some wild aerobatics, take the time to check everything out. Judging speed becomes more difficult at high altitude, and the wing is the most likely location for a problem.

How many times have you heard the

(Continued on page 62)

CENTER ON LIFT

The "Old Buzzard Goes Flying!" video, which is available from Soaring Stuff, is an excellent tutorial on the basics of R/C thermal soaring.

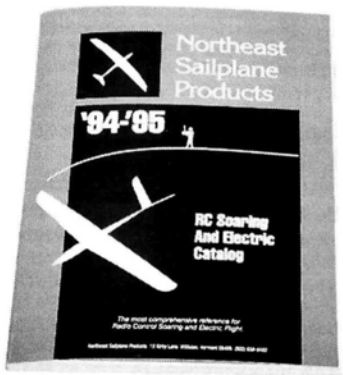
words: "Sounds like flutter to me"? Hearing sound from a glider is not a good sign. It's time to inspect all the linkages and test them for excessive play. The servo gears might have problems. To check, slowly actuate the servo while applying some load to the control surface. Unless you fix the source of a flutter problem, you're inviting trouble in the future. Other sounds, such as a cracking noise at launch, need to be investigated, too. An HLG wing that cracked on the last launch will probably fail totally on the next. It's much easier to add some fiberglass to repair the crack than it is to put a wing back together and fix the damage to the rest of the model.

Landings are the biggest cause of damage to fuselages and servos. Any landing where the model flips over, slides sideways, or turns around warrants a good post-flight. Look for cracks in the fuselage. Check the rudder post, and pull off the canopy to check the servo tray. Finally, check the wing mount and the tail mount for cracks or a loose fit. Use of extreme landing aids also invites problems. Does your model stop instantly? You're inviting problems, and it's a lousy way to learn how to land.

OLD BUZZARD GOES FLYING!

Using only Carl Goldberg Models'* Gentle Lady, Dave "Old Buzzard" Thornburg, with the assistance of Taylor Collins of Soaring Stuff*, has put together an excellent 45-minute video on the basics of thermal soaring. Beginners and pilots who want to improve their understanding of thermals can benefit from watching this tape. The information is presented through flight examples and simple computer graphics. It's all easy to understand, and the presentation is informative and entertaining.

Dave Thornburg knows what he's talking about when it comes to thermals. His "Old Buzzard's Soaring Book" is something every soaring pilot should read and revisit regularly. The Old Buzzard starts by taking you through the basics of thermal soaring. In the second half, you see how hand-launch flying can further improve your skills. Don't forget to watch all the way through the credits.



Looking for a new plane? The new catalogue from Northeast Sailplane Products features more than 200 planes. Check it out.

NORTHEAST SAILPLANE PRODUCTS CATALOGUE

Still looking at the same old tired sailplane? Get a copy of the latest Northeast Sailplane Products '94-'95 catalogue, and take a look at the R/C soaring marketplace. The latest edition is even bigger and better than the last one. This catalogue has grown a lot over the years, and it has close to 200 different models listed in its 200 pages. My favorite additions to the catalogue are the Curt Nehring "Soartoons." Give NSP a call if you don't have one—(802) 658-9482.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

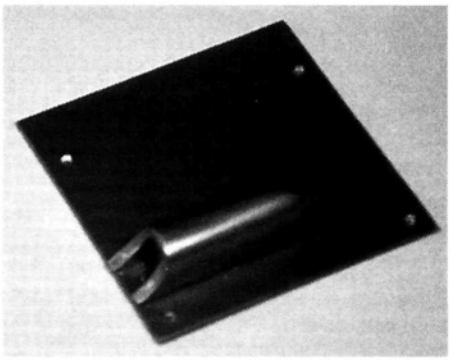
HOW TO

Attention to small details makes a world of difference

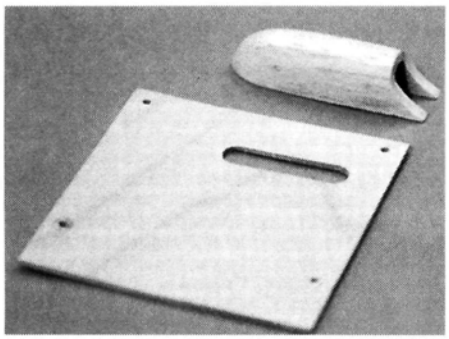
Cover Those Small Annoying Pieces

by FAYE STILLEY

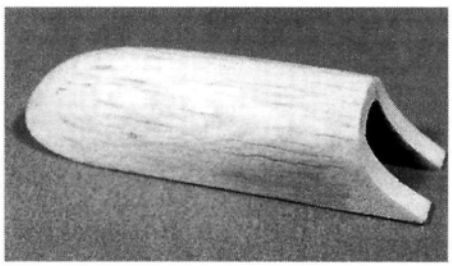
THE APPEARANCE of a beautiful model can easily be ruined if the small details are not treated with as much care as the big parts and pieces. Last month, I showed you how to build a low-profile servo mount; now I'll show you how to cover the hatch cover.



1 *Trim irons are a must for doing this kind of work. It's always best to cover as many parts as possible—large or small—before gluing them together.*

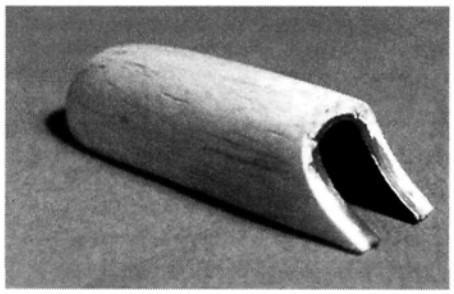


2 *Using a servo-hatch cover and a cowl as examples, here are some covering techniques for "small things." The two parts of the assembly have been cleaned and sanded smooth with 600-grit sandpaper, and they're ready for covering.*



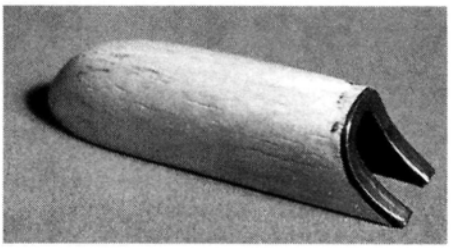
3 *The cowl measures ½x1¾ inches. It would be virtually impossible to cover it after it has been installed on the hatch cover. Its curves require that the covering be stretched a lot, and the interior must be covered to protect it from fuel and dirt.*

4 *Begin by covering the inside of the cowl. A small piece of covering is cut and ironed onto the inside surface. It is stretched around the opening on the end and sealed to the edge of the outer surface. Several cuts are made in the covering to allow it to be pulled into shape around the curved part of the opening. For this step, a trim iron with the curved shoe works best.*



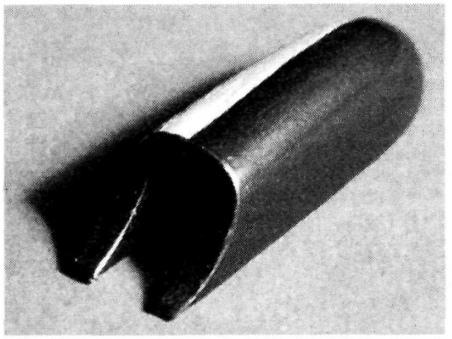
5 *The inside covering is complete. It has been wrapped around the opening and trimmed. Note that a small border of covering has been left on the outside. This will provide a fuelproof seal when the outside covering is applied over it.*

6 *The outside of the area with the opening is now covered. Once again, a trim iron with the curved shoe is used. As this section of covering is applied, it is pulled around, and a little is sealed to the top rounded area of the cowl.*

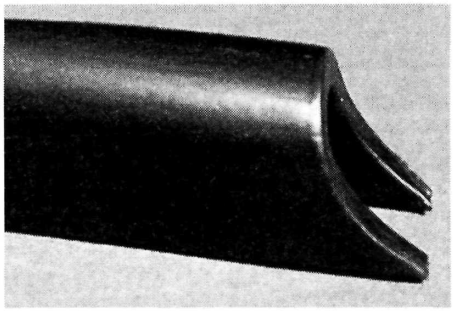


7 *The outside of the opening is finished and trimmed. A small border of covering is sealed to the top rounded area of the cowl; it will seal the top covering into place. A slight residue of adhesive is left after the covering has been trimmed. This will present no problem because the top covering is the same color.*

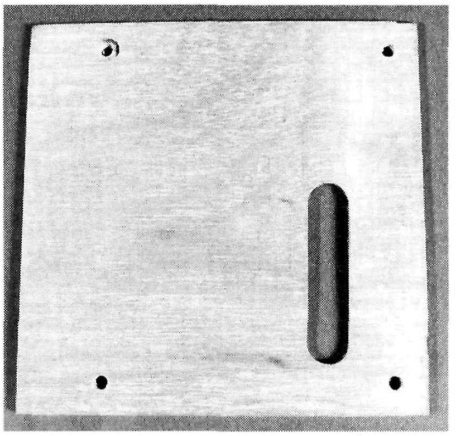
8 *A lot of stretching is necessary to make the covering conform to the top of the cowl's compound curves. Work slowly, heating the covering while you stretch it and before you seal it down. When it conforms smoothly to the surface, pass the iron over it, applying some pressure. After removing the iron, hold the covering in place for a few seconds to give it time to cool and adhere to the wood. Use the trim iron with the flat shoe.*



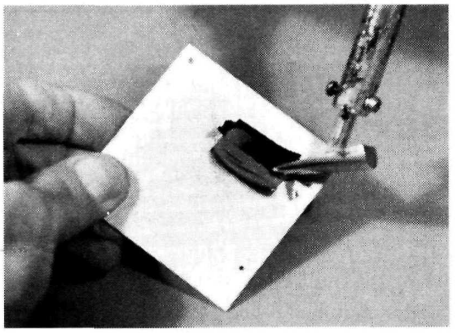
9 *Half of the cowl has been finished and trimmed straight down the middle. The covering was stretched around the previously covered area around the opening and then trimmed and sealed down. Small seams like these are virtually invisible.*



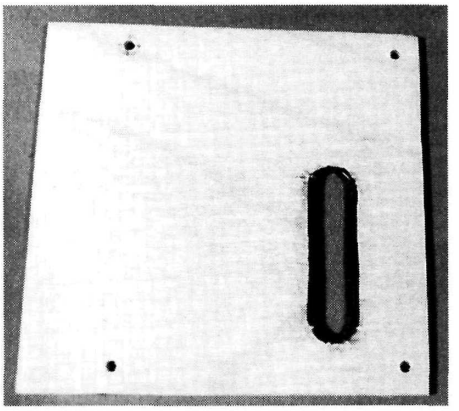
10 *The second half of the cowl is covered in the same way as the first, but a small overlap is made along the center to form a fuelproof seam. Just 1/16 inch is enough for this type of seam because there is no strain on it.*



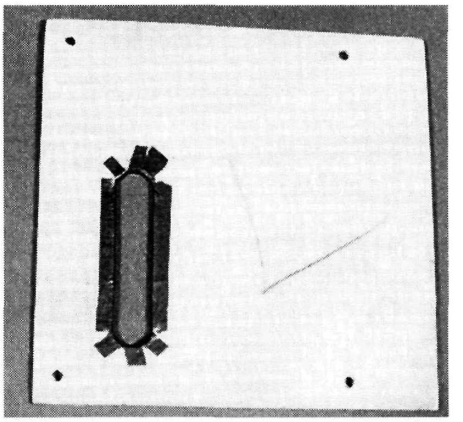
11 *The hatch cover measures 2½ inches square and is 1/16 inch thick. The edges have been beveled slightly in toward the underside. This allows a nice snug fit in the hatch opening.*



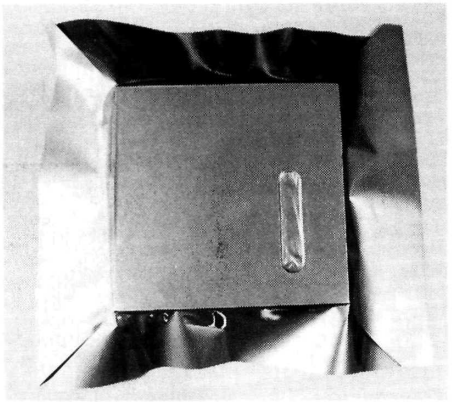
12 *The edge of the slot is covered first. The trim iron with the rounded shoe works well because the ends of the slot are rounded. Cuts in the covering are made at the rounded edge of the slot to allow the covering to be stretched into the curve.*



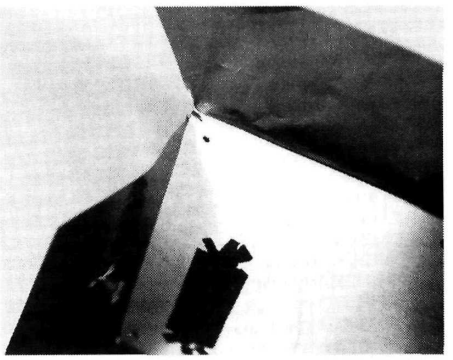
13 *The covering on the edge of the slot has been pulled around onto the outside of the hatch, sealed down and trimmed. This small border serves the same purpose as the one around the cowl. It is the base for the seam that will be made later.*



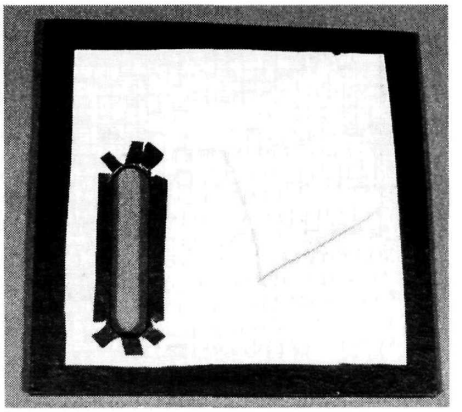
14 *The inside of the hatch receives the same treatment as the outside, but the trimming isn't as carefully done. The inside will not be covered; after the covering has been completed, it will be painted to fuelproof it. The paint will overlap the covering to form the seal. The "L" on the hatch is just my reminder that this one goes on the left wing.*



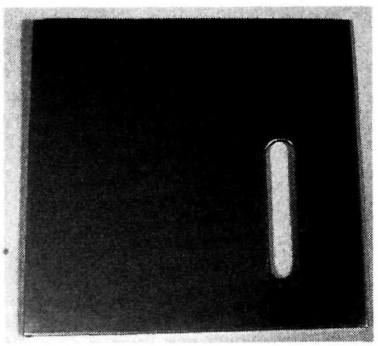
15 *Cover the outside of the hatch cover. Because the part is so small, simply iron on the covering. The area where the slot will be gets special attention. The covering is pressed down into the slot as far as it will go before it's cut. This ensures a good seal at the edges.*



16 *The covering has been cut at a 45-degree angle at each corner. To get a neat, tight seal at the corners, one side is ironed down along the edge and then wrapped around the corner. It is then trimmed flush with the bottom of the hatch and pulled back out of the way. This allows room for the next piece of covering to be sealed along the side and over the corner in a similar way. The overlapping corners form the seal, and the seam is virtually invisible.*



17 *The four edges are sealed, and the covering is folded over and ironed onto the inner surface of the cover. The covering is cut at a 45-degree angle at each corner, and the excess is trimmed off. This border is about ¼ inch wide. The covering that was over the slot has been cut, pulled through the slot and sealed down. This side of the hatch cover will be finished by painting; the paint will overlap the edges of the covering to form the final seal.*



18 *The hatch cover is finished and nearly ready to have the cowl installed. Put the cowl into place, and draw a line around it. The line serves as a guide to cut away a little covering in the area that will be under the cowl. Exposing bare wood ensures a good bond when the cowl is glued into place. Before the cowl is glued on, the hatch cover should be attached to the wing so that it takes the shape of the airfoil.*

Attention to small details ensures not only a good-looking covering job, but also one that will last a long time. ■

ENGINE REVIEW

RJL K.61 R/C Engine

by Dave Gierke

Superb power-to-price ratio!

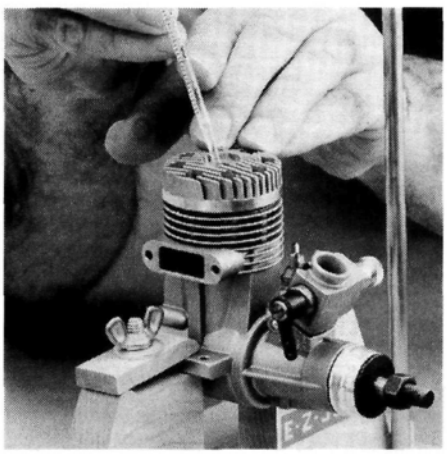
IT'S GREAT to be back in the workshop, and it's time do some engine reviews! Because of winter weather here in the Northeast (western New York), I'll be forced to digress from the normal in-flight testing until better flying conditions prevail. But I'll still do engine break-in and dynamometer performance testing as well as an expanded design and construction section. Let's get started!

The subject of this month's review is the American-made RJL* K.61 R/C. This isn't a new design. Originally, it was called the Kraft .61 and was the brainchild of former world R/C aerobatics champion Phil Kraft. Designed by Roger Theobold, the engine was state of the art during the early 1970s. Preproduction prototypes included a crankcase with helical angled bypass passageways, which induced a swirling action to the transfer gases as they entered the cylinder.

Known affectionately as the "swirly snuerly," this hybrid Schnuerle-transfer-porting system was supposed to improve the delivery of air-fuel gases from the crankcase and more thoroughly pack the cylinder. The anticipated increase in torque and power was expected to provide a performance edge for R/C aerobatics models. Unfortunately, the prototypes didn't measure up and the swirl feature was dropped. A completely new mold had to be machined for the investment-cast (lost wax) crankcase; Kraft subcontracted this to Ralph Cooney (now of Fourmost Products). Eventually, the more conventional design was offered for sale in 1974. When Kraft went out of business, the entire K.61 R/C engine program was obtained by Randy Linsalato of RJL Industries.

BREAK-IN

It was late in December when I tested the K.61. It was unusually mild for that time of the year, with temperatures in the mid-30s. Unfortunately, 15mph winds with gusts to 25mph produced a nasty wind-chill factor. Since there wasn't any rain or snow, a little discomfort wasn't going to stop me from proceeding.



With the piston at TDC, the engine's combustion-chamber volume is being determined by filling its cavity with low-viscosity oil. A laboratory pipette allows accurate fluid delivery through the glow-plug hole (measurements to the nearest 1/100ml.).

Editor's note: Dave Gierke's book, "2-Stroke Glow Engines for R/C Aircraft," is now at your hobby shop! Dave says that researching, writing, rewriting, photographing, producing technical drawings, corresponding with engine experts, manufacturers, distributors and collectors was a concentrated and stimulating experience that occupied most of his free time over two years. Anyone who's interested in the many facets of our miniature engines will benefit from reading his book; it has 175 pages, 75,000 words, over 500 photos and 100 diagrams as well as a fully cross-referenced, comprehensive index.

I installed a recently balanced Top Flite* 11x7 propeller on the engine's shaft and filled the tank with break-in fuel consisting of 15 percent nitromethane, 24 percent lubricant (half castor oil and half Klotz* KL-200 synthetic) and methyl alcohol. The RJL K.61 is equipped with an aluminum piston and cast-iron ring that run in a steel sleeve. For this combination of metallurgy, the break-in procedure should provide brief, cool and well-lubricated runs. To achieve this, the air-fuel mixture must be adjusted so that the engine is 4-cycling (rich), especially for the first half hour of operation. Full cooling between runs allows heat cycling to occur; many believe this provides stress relief to the various component parts that assist the wearing-in process.

The first few runs used battery-assisted glow heat to maintain reliable combustion at 9,500rpm. Since I could hold the cylinder head with my bare fingers without getting burned, I decided the engine was operating much too coolly to produce a smooth, non-battery-assisted operation. To heat the engine, I decided to lean the mixture to a rich 2-cycling mode for the next 30 minutes—3-minute running periods at 10,500rpm. During this period, the engine developed an occasional momentary cutout, when the air-fuel mixture was briefly peaked to 12,000rpm. A simple check verified that the compression ratio and/or glow-plug heat range probably weren't the sources of the problem. Note: this check requires that the engine be adjusted to a slightly rich 2-cycling needle-valve setting, with battery-supplied glow heat in place. With tachometer in hand, remove the glow heat while carefully monitoring the rpm; if it drops off, the combustion process is impeded and changes should be made. A

hotter glow plug could be installed; a hotter fuel containing more nitromethane could be used; or the compression ratio could be increased. Always try the least invasive technique first, leaving the compression-ratio change as a last-resort tactic.

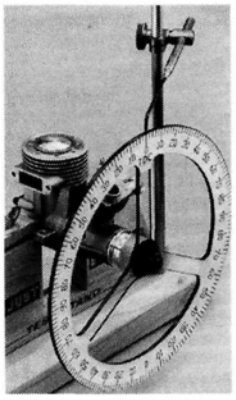
After an hour's running, with the engine still "burping" occasionally, I adjusted the needle valve to slightly richer than peak rpm. If it would hold a setting for 10 to 15 seconds without losing speed, break-in would be almost complete. It held at 12,100rpm; however, if I momentarily pinched the fuel line, the speed would jump to 12,400 to 12,500rpm; unhappily, if I tried to lean the mixture to this rpm level, the engine would suddenly "sag" (lose speed). If the mixture hadn't immediately been generously richened, the piston would have seized in the cylinder; this can be calamitous to the machinery. Clearly, something was wrong! To satisfy my curiosity, I installed temperature instrumentation on the cylinder head and ran the K.61 back to 12,100rpm. Surprise, surprise—210 degrees Fahrenheit! (much too cold!).

I cut a piece of aluminum foil tape 5/8 inch wide and 6 inches long, and I wrapped it around the cylinder fins, just above the exhaust; it stays in place because of the adhesive backing. I've had this roll of foil in my toolbox forever, so I can't remember where it came from; I think it's used in refrigeration, or possibly the heating and cooling industry; I bet 3M Products has the stuff.

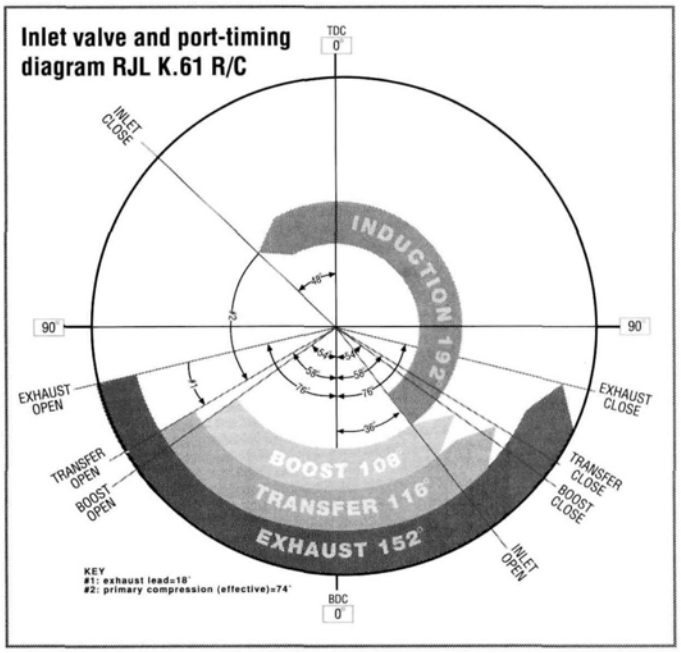
Anyway, the engine was restarted and slowly needled to a smooth 12,300rpm with no apparent problems. The head temperature climbed to 375 degrees F and leveled off. Before the next run, I installed another piece of foil (3/16 inch wide) over the front edge of the head fins and tried again; this time, the temperature increased to 410 degrees F with a peak of 12,400rpm. Leaving the tape in place, I continued my break-in procedure for a total of 1 hour, 45 minutes, at which time, it held steady for the required 20 seconds. The engine was ready for the dyno.

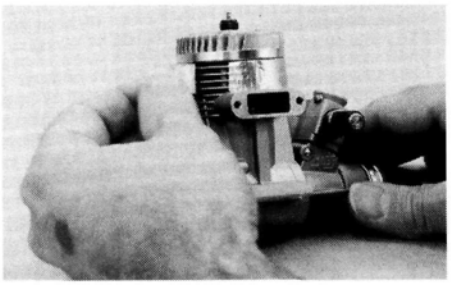
As I installed the K.61 on the dyno, I found myself denying that overcooling could retard an engine's performance to the degree I had just witnessed. But it has been many years since I've flown powered models in the cold of winter; starting balky engines and then keeping them happy required tricks that I had long forgotten. After some reflection, here are a few of the things that help:

• cylinder heads warmed with a propane torch before starting;



This setup allows accurate measurement of the engine's inlet, transfer and exhaust-port timing. The degree wheel is homemade. See "2-Stroke Glow Engines for R/C Aircraft," if you want to make one for yourself.





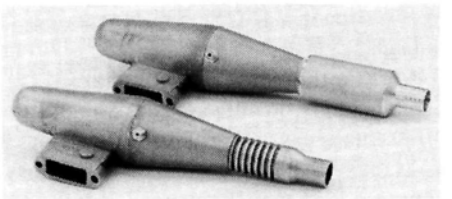
Installing the aluminum-foil tape on the cylinder's cooling fins.

• higher-nitro fuels;
• hotter (heat range) glow plugs;
• restricted cooling (see sidebar).

DYNAMOMETER TESTING

The aluminum tape used during break-in was removed, and the cylinder-head instrumentation was reinstalled. A few trials were needed to adjust the level of cooling; rpm and torque readings would be retrieved when the head temperature stabilized at 410 degrees F.

As you might imagine, dynamometer testing can be tedious. At least 10 seconds is required to retrieve performance data. If the engine refuses to maintain its peak power setting for that period, the data will not be representative of its potential. There were no such problems with the K.61; it maintained a steady peak power setting throughout load tests, which ranged from 8,500 to 15,000rpm. From the graph, you can see that the shaft torque peaked at about 9,500rpm, while brake horsepower maxed at about 12,500rpm. Fuel consumption in this range was about 1 ounce per minute; 15-percent-nitromethane fuel containing 20 percent lubricating oil was substituted for break-in fuel during the dyno evaluation.



The standard muffler (front) and the "hush" muffler modification (rear).

FLIGHT PROPELLERS

A number of flight propellers were evaluated for rpm after the engine had been removed from the dyno and reinstalled on the test stand. The selection was limited to props that might be used for sport-pattern applications. Scale or trainer models would use propellers with larger diameters and lower pitches, e.g., 12x6, 13x5, etc. (see the included chart).

RPM OBTAINED WITH A VARIETY OF PROPS

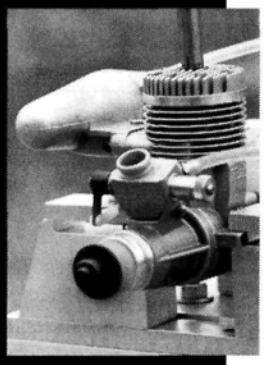
Propellers	rpm
Top Flite 11x7	12,400
Master Airscrew 11x7	12,300
APC 11x7	12,600
Rev-Up 11x7	12,400
Master Airscrew 11x7.5	12,200
Zinger 11x7.5	11,600
APC 11x8	11,500
Top Flite 11x8	11,900

NOISE EVALUATION

The K.61 comes equipped with the standard two-piece muffler or the new "hush" chamber that's attached to the outlet portion of the standard muffler body (see photo). The

HAZARDS OF OVERCOOLING

If you plan to operate miniature engines in cold weather, it's imperative that overcooling be avoided to the same extent as overheating. Unfortunately, overcooling is generally thought to be harmless. I'm now convinced that an engine can be prematurely worn out or completely ruined by low-cylinder-temperature operation.



RJL K.61 R/C running on the test stand. Glow-plug heat is maintained during early runs.

Here's what happens: in the case of the RJL K.61 R/C, the drop-in cylinder sleeve is in direct contact with the aluminum-alloy cylinder. Because this configuration cools well, the steel sleeve doesn't expand nearly as much as the aluminum piston, which has no direct, efficient path for cooling. The clearance between the piston skirt and sleeve quickly diminishes to a point at which rubbing friction and additional heat occur. This produces more expansion, more contact and more heat—a vicious circle. As I discovered, cylinder fins must be blocked off from the cooling air stream to reduce the heat transfer and elevate the temperature of the cylinder and sleeve, so allowing them to expand more uniformly with the piston.

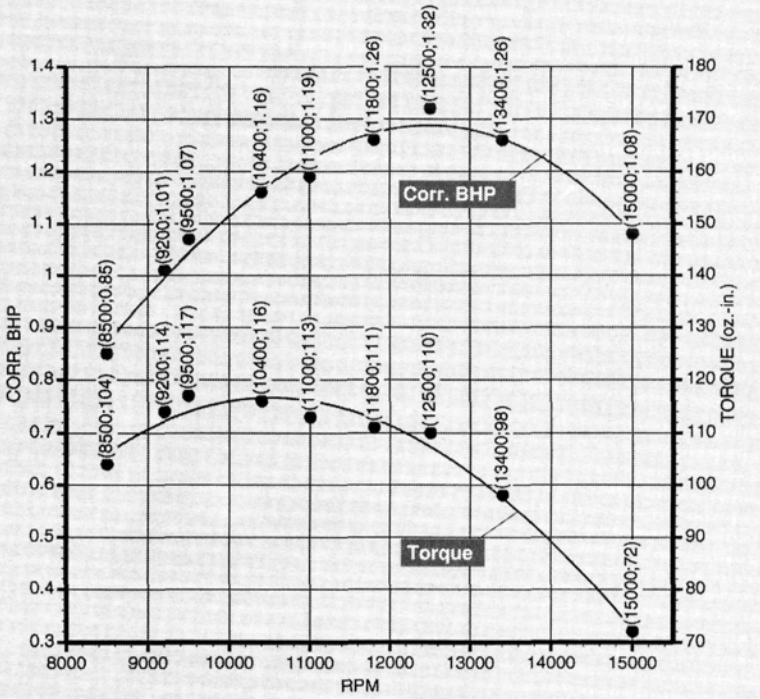
The question is, "How do you know if the engine is being overcooled?" If, after 15 seconds of operation, you can hold your finger on the cylinder-head fin without getting burned, there's definitely too much cooling. Unfortunately, after about 135 degrees F, our sense of touch is a poor indicator of temperature, because we're now getting burned! What we need is temperature-indicating tape that can be stuck to the cylinder head or anywhere else on the engine. As the temperature increases, the tape changes color and remains that way; it's then compared with a color chart that indicates the temperature within a small range. By restricting air passage through the cooling fins and using temperature tape, an enthusiast can dial in 375 to 425 degrees F, for safe wintertime operation. Temperature sensors are now available for modelers. MIP's* On-Board Temp™ Gauge is available in both Fahrenheit and Centigrade versions, and its LCD is visible from 10 feet. (Of course, it's also fuelproof.) CRC's* liquid-crystal Quick Temp Tape will also do the job. I'll review these products in a future article.

ABC-type engines are more susceptible to rapid wear than ringed engines because of their tight piston-sleeve clearances. Broken connecting rods are a distinct possibility when the engine is operated in the overcooled, piston-sticking mode.

Dynamometer Test Results

RPM	TORQUE	CORR. BHP	BHP	CORR. FACTOR	DISTANCE
8000					
8500	104	0.85	0.88	0.97	2.16
9200	114	1.01	1.04	0.97	2.362
9500	117	1.07	1.10	0.97	2.43
10400	116	1.16	1.20	0.97	2.395
11000	113	1.19	1.23	0.97	2.344
11800	111	1.26	1.30	0.97	2.3
12500	110	1.32	1.36	0.97	2.275
13400	98	1.26	1.30	0.97	2.032
15000	72	1.08	1.11	0.97	1.5
15500					

TEST CONDITIONS
Coefficient 48.25
Wet bulb (F).....3.30
Dry bulb (F).....3.50
Bar. pressure (Hg) 30.22
Vap. pressure (Hg) 0.19



standard muffler produced a not-so-quiet 99dB at 9 feet, while the "hush" unit quieted things down to 97dB, which is better than average for manufacturer-provided mufflers. Dyno tests were performed using the "hush" unit; the standard unit produces more power.

ENGINE CONSTRUCTION

The K.61 is produced using computer numerical control (CNC) machinery, which ensures exacting tolerances. The crankcase is an expensive investment casting that produces exact internal features such as bypass channels. Unlike many die-castings, this type of casting resists the warping and deformation that are caused by cooling. High strength compared to weight is another important advantage.

A massive hardened- and ground-steel crankshaft with a 5/16-24 screw thread, rotates within twin ball bearings; the front bearing is equipped with a dust/dirt shield. The crankshaft requires a light to moderate push-fit to install—a welcome feature that minimizes slippage, friction and energy loss through heating.

Note: although not recommended by manufacturers, many enthusiasts prefer to disassemble their engines for maintenance and repair. One of the most common mistakes concerns the removal and installation of the crankshaft. A hammer should never be used to tap a crankshaft out of or into its bearings; the steady force provided by an arbor press or a drill press won't dent the delicate inner races of the bearing or damage the balls themselves.

The drive-washer is held firmly on the crankshaft with a tapered split cone. The sealed area between the crank and its housing (between the rear of the front bearing and the venturi induction hole) maintains a nice centered 0.002 inch total clearance; this close fit helps to prevent fuel blowby through the front bearing during primary (crankcase) compression. A short linear groove that runs parallel to the crankshaft on the inside top of the housing, between the front bearing and the crankshaft induction port, provides a degree of negative pressure that helps to clear any fuel buildup (potential leakage) from behind the front bearing. RJL refers to this as a "re-circulating oiling system."

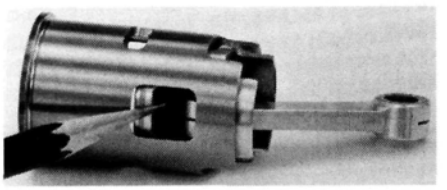
When assembled with the propeller tightened into place, the crankshaft doesn't produce any measurable end play, indicating that the balls of the front and rear bearings

are pre-loaded against their races. Generally, this isn't considered desirable for class 1 or 2 ball bearings; they wear better (less) if unloaded, with their 0.002- to 0.004-inch internal clearance manifested as axial end play. Randy indicated that a bit of end play usually turns up after a few hours of operation, and bearing problems have never been a concern.

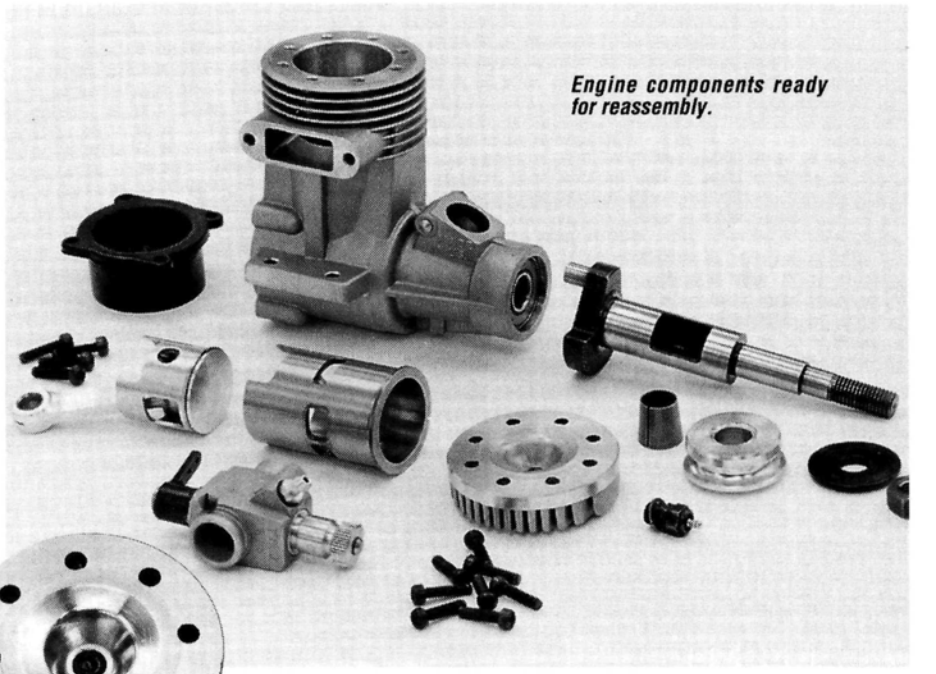
The connecting rod is machined out of aluminum-alloy bar stock and is fitted with phosphorous-bronze bushings at each end. The piston is forged out of 2014 aluminum for strength and durability. An unusual feature of the piston is its domed crown, which adds to its strength and is found in many modern motorcycle engines. The piston is fitted with a single meehanite (fine-grain iron) compression ring that's pinned into position so it can't rotate. The Schnuerle transfer ports, coupled with a large boost and exhaust port, provide efficient gas passage into and out of the engine's cylinder sleeve. If it isn't pinned, the ring's ends could work their way into these openings and certainly cause damage. Fixing the ring ends with a pin where there aren't any ports avoids the problem.

The drop-in cylinder sleeve requires a little heating (with a propane torch) to remove or install. Made of hardened steel and precision-honed to size, it's designed with a piston-skirt-to-sleeve clearance of 0.002 inch (cold). My test engine measured a little less (0.0015 inch), and that partially explains why I had trouble with break-in. It should be noted that all ringed engines are manufactured with more piston-to-sleeve clearance than representative examples of lapped engines, including ABC types; they tend to rock slightly, especially near mid-stroke, and they sometimes produce a slight scuffing of the skirt below the ring. Although unsightly, these superficial marks don't seem to interfere with the engine's performance.

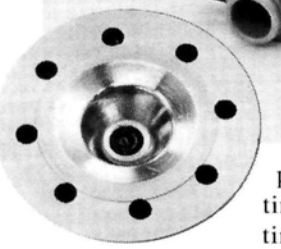
Severe scuffing is another matter, and it's usually the result of a very lean run, poor lubrication, or both. The condition may become catastrophic if the piston's relatively soft aluminum is displaced into the groove, where it invariably locks the ring. Not being able to expand, the ring can't seal to the cylinder wall; the hot gases of combustion blast by the side of the piston with the temperature of a cutting torch, many times welding or melting the ring permanently into its groove. Need it be said that the engine stops running? Of course, these events happen in a fraction of a second—in much less time than it takes to describe them.



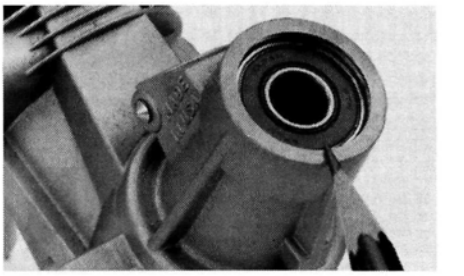
Large boost-port window in piston and sleeve. The air-fuel mixture flows through the piston for additional cooling.



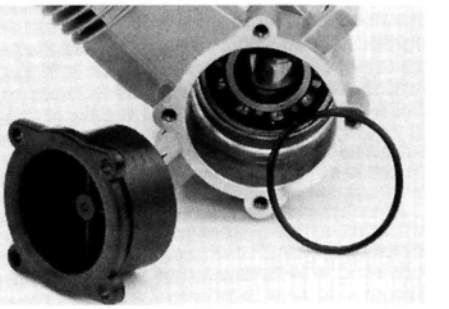
Engine components ready for reassembly.



Die-cast cylinder-head with wide, highly angled squish band. Notice the flat (flangeless) "manhole-cover" design and eight machine-screw holes.



Front ball bearing with dust/dirt shield.

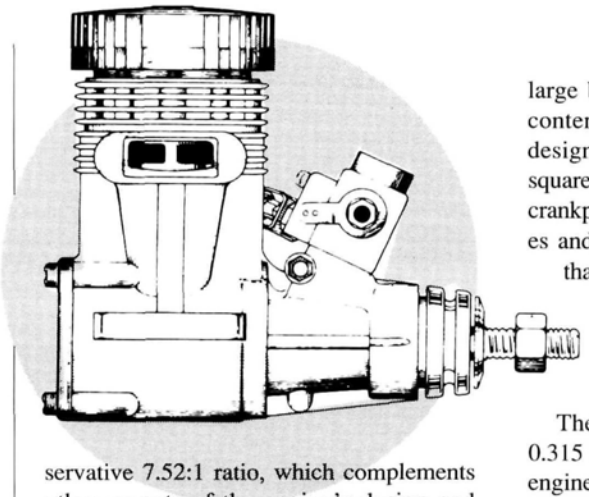


Composite plastic rear cover with O-ring seal.

I recall an incident that happened to me as a teenager while I was flying control-line after dark. Because of a lean needle-valve setting, my engine began to overheat and sag (lose rpm). Back then, our models weren't equipped with throttles or shut-off devices, so you had to choose between "frying" the engine and flying the model into the ground to stop the process. I chose the former and regretted the decision; a shower of sparks streaming from the exhaust signaled the end of the road for my distressed ringed engine.

Like most manufacturers, RJL doesn't want you to disassemble their engines; in fact, RJL states, "...doing so will void your warranty—no exceptions." They have good reasons for this policy, especially with regard to reinstalling the pinned-ring piston in the sleeve. A very exacting procedure is required to ensure that the delicate ring isn't damaged. Randy does a nice job explaining this procedure in issue no. 11 of the *Model Engine Enthusiast* (an in-house publication). You can obtain the latest copy for $1, which covers the cost of printing and postage. (Write or call: RJL Industries, P.O. Box 5, Sierra Madre, CA 91025; (800) 359-6972.)

Another interesting feature of the K.61 is its "manhole-cover" cylinder head. Unlike most contemporary engine designs, the K.61's head is mounted flush, so it doesn't protrude into the sleeve. Many experts believe that a closely fitting flange-type head helps maintain sleeve roundness. It should, however, be noted that other manufacturers, including SuperTigre, have used this system with excellent results. A good seal to the top of the sleeve is ensured by using eight machine screws in the cylinder-head and a careful cross-torquing technique. The cylinder head's combustion chamber is hemispherical with a wide and highly angled squish band. After checking the combustion-chamber volume (piston at TDC), I was able to calculate the effective compression ratio. I wasn't surprised to find a con-



servative 7.52:1 ratio, which complements other aspects of the engine's design and accounts for the relatively low torque per pound of engine-weight ratio (oz.-in./lb.) of 99. The K.61 could easily tolerate a higher compression ratio, but other details, such as its excellent idling characteristics, would probably suffer.

Other features include the composite plastic rear cover, which is fitted with an O-ring rather than a paper gasket (eliminating the possibility of leaking at this location). The large-diameter primary needle valve (0.475 inch) makes adjustments effortless, despite the relatively high torque required. An airtight seal between the needle valve and the spray-bar body is required if reliable fuel metering is to be maintained at the carburetor's venturi. Tightly fitting threads coupled with a variety of sealing methods, including O-rings, produce "hard-to-turn" units. Because traditional needle-valve diameters require high twisting forces, a dangerous situation exists; you must be very careful not to slip off the valve and enter the propeller's plane of rotation! I wish other engine manufacturers would incorporate this subtle feature in their designs.

The K.61 is fitted with a variable-mixture carburetor that automatically alters the fuel and air as it's closed toward idle. Complete break-in is required before a reliable idle and transition to high speed can be attained. The undersize break-in propeller should be replaced with a flying unit; this larger, heavier propeller generates more flywheel effect and yields a lower, smoother idle. Although the engine must be stopped and restarted several times to adjust the secondary mixture screw (with a screwdriver), from the safety point of view, it's worth the effort. Please don't try to perform this task with the engine running; you're too close to the propeller arc. I found that a reliable idle could be achieved at 2,400rpm, with a uniform and instantaneous acceleration to full throttle.

SPECIFICATIONS

With a stroke/bore ratio of .93:1, the K.61 is classified as an "over-square" design. Engines having a relatively short stroke and large bore have higher crankpin forces to contend with compared with long-stroke designs of the same displacement. Over-square engines usually have larger-diameter crankpins; potentially higher frictional losses and a larger, heavier connecting rod at that end of the engine represent some of their negatives. Of course, long-stroke designs have their share of problems that over-square engines avoid. Everything is a compromise.

The carburetor bore is conservative at 0.315 inch (8mm); although it restricts the engine's ability to induct air, which limits maximum torque and horsepower, a small bore ensures good fuel delivery and excellent idle-transition characteristics.

Checking the engine's induction and port timing with a degree wheel confirmed the conservative design philosophy behind the K.61. The exhaust port remains open for a total of 152 degrees, which is fine for muffler-equipped engines, but not long enough for tuned pipes designed to increase peak power through elevated rpm. The crankshaft's induction port also closes at 48 degrees ATDC for a total duration of 192 degrees, which agrees with other design aspects.

The engine compares favorably with the Enya .60 XF-4 ringed engine, which I believe to be the standard of excellence for sport 60s today. The K.61 is a nice engine; it starts easily, runs smoothly, produces moderate power for its size and idles well. To the sport flier, the most important feature of any engine is long life and dependability. The K.61 demonstrates these desirable traits (along with readily available parts and fast, expert service from the factory, if needed).

Finally, RJL provides a thorough owner's guide for the K.61 R/C; it includes technical data, safety instructions, starting and break-in procedures, fuel specifications, adjusting the carburetor, aircraft installations, troubleshooting and maintenance. The engine has a two-year limited warranty that protects the buyer against defects in materials and workmanship. A complete parts list is also included for ordering purposes—something that several other manufacturers tend to omit from their literature.

In short, at a selling price of around $115 (with muffler), the American-made RJL K.61 R/C is a powerful, smooth-running sport engine at an incredibly low price—a cost-effective, reliable piece of equipment for today's modelers.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

A few of the BVM contingent cheerfu

Jeff Seymour with his SWB-4 turbine-powered JMP T-33.

Inset: tidy SWB-4 turbine installation in Jeff Seymour's JMP T-33 (talk about ease of installation!).

METROPOLIS! The very name stirs up an image of a t
evil, and the local hero flies around wearing his blue-
Well, although I never did get a picture of event dire
two out of three ain't bad!

If you're wondering, Metropolis, IL, is just across the river t
you'll book your airline tickets to if you plan to attend the Su
shows every sign of becoming one of the best attended jet me
numbered 133 from 23 states and four countries (*not* includin
latest accomplishments in R/C jet modeling.

by RICH URAVITCH

NO LOIS, NO CLARK—

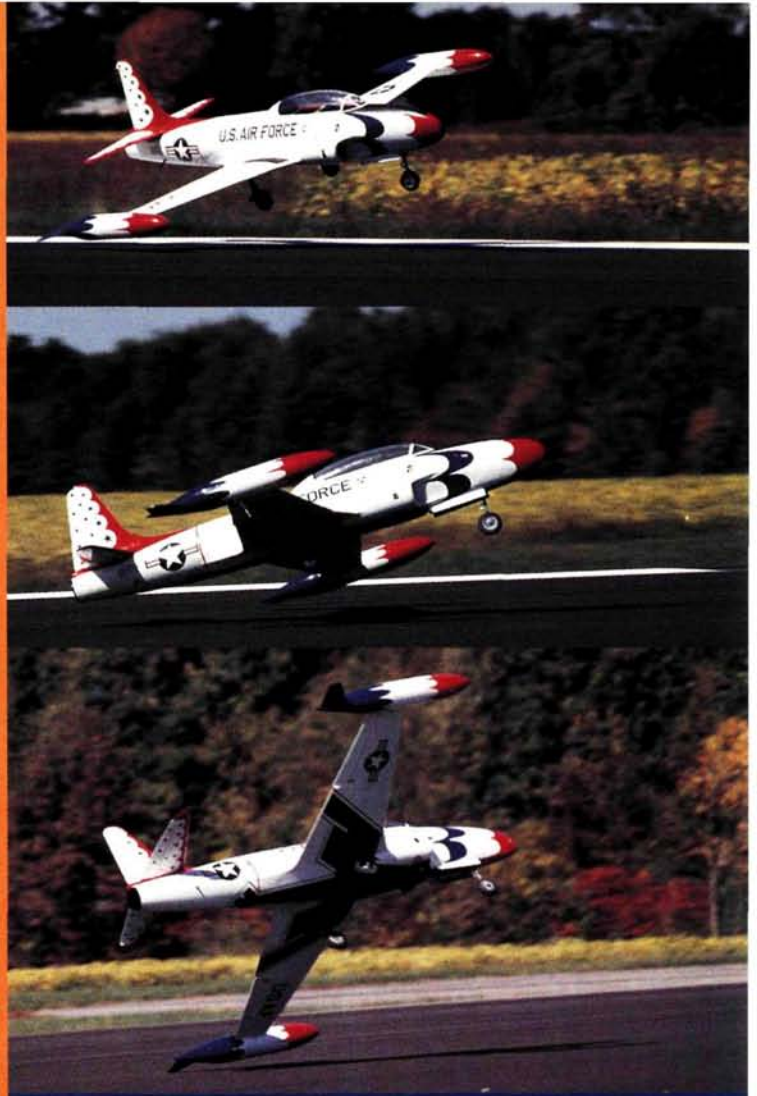
SUPERMA

Bob Violett's F-4N Phantom on the deck and secured for the night.

ind some of the machinery they brought.

lace where exciting things happen, good *always* overshadows cape-equipped leotard with a big "S" emblazoned on his chest! Caudle in tights (but people would probably *pay* for that one),

other well-known hub of activity, Paducah, KY, which is where 5 Fan Fly. And attend you definitely should, because the event here! Participants at the '94 event, which took place in October, and spectators were treated to a first-hand look at some of the



"Tip Tank Tango"

These photos show what can happen if you aren't careful while landing in a crosswind. Both T-33s seemed to get a little slow on landing, one wing dropped, roll correction was input, and the other wing dropped—probably a result of unintentional overcontrol. Fortunately, no serious damage was sustained by either T-Bird, but it gave cause to remember that, as our models get larger, they start to fly more like full-size airplanes. Incidentally, the above photos are of a JMP bird; the one below is a BVM.

T MARATHON JET FLYING!

FAN FLY

PHOTOS BY RICH URAVITCH

SUPERMAN FAN FLY

Louis Patton's Byron F-15 on final approach with speed brake deployed. This relatively early design remains a reliable, easy-to-fly performer.

Wow, an electric jet that performs! Dave Ribbe's own design; scratch-built, retract-equipped MiG-15 uses an Astro Flight 40 motor, re-worked Viojet rotor and 20 cells; 7 pounds, much of it batteries.

Above: just try telling Mike Kulczyk's magnificent F-84G Thunderjet from the real thing. There is absolutely NOTHING to give it away as a model! Scratch-built, own design; fiberglass fuselage; Uses Viojet propulsion package.

Above: unquestionably one of the prettiest models at the meet: Garland Hamilton's F-80C Shooting Star in Kansas Air Guard, non-standard colors. This model was later lost in an unfortunate midair; EVERYONE felt bad about this one!

Left: this is about as perfect a touchdown attitude as there is for the F4D Skyray. Mark Frankel's "Ford" is a real contradiction because he's a Chevy dealer! Scratch-built from his own plans; fiberglass parts are available.

This year, the three-day event was co-sponsored by Horizon Hobby Distributors* and your favorite R/C magazine, *Model Airplane News*. Jerry Caudle and his band of recruits made sure that things moved along at the appropriate pace and that everyone was happy. (He can do that, you see, because he's the airport manager, and he shut the place down to all full-scale traffic except Dave Voglund's SNJ Texan!) Jerry also has a full-scale-aircraft refinishing business and a hobby shop at the airport, so you should now have a much better understanding of how he manages to produce all those award-winning models we frequently see at major competitions.

AERO INNOVATION

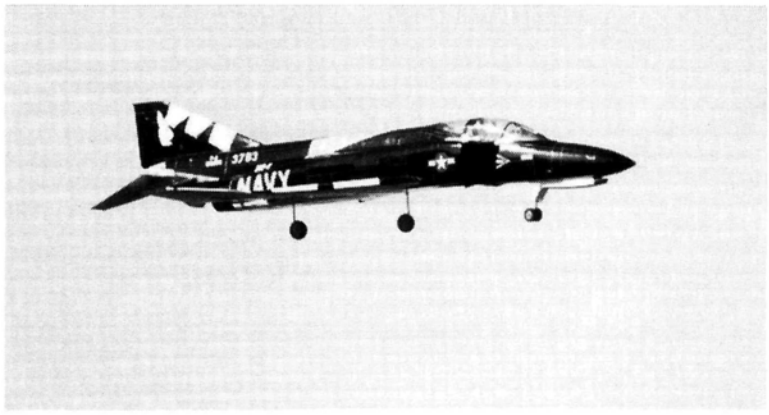
The progress R/C jet modeling has made over a relatively short time never ceases to amaze me. What was formerly an activity pursued by a small number of ardent jet enthusiasts who found contentment in just making an R/C model *fly* with ducted-fan power has now given way to large numbers of mainstream modelers flying high-tech aerial hot-rods. We now routinely see them at fan events such as this.

One of three Avonds Eagles on hand. This one, by Mike Lesher, uses a Ramtech fan to provide scale-like performance. The kit is available from Aeroloft.

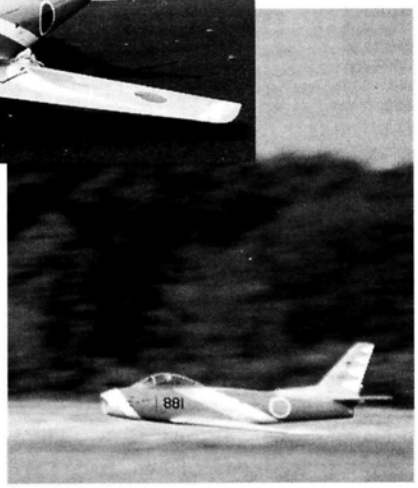
A relative newcomer to ducted fans, Pat McCurry did an outstanding job on his Maverick. Pat claims Frankie T. provided documentation for the tactical camouflage scheme.

The old days of working with non-carbureted racing engines turning primitive rotors inside fan units hung on the outside of whichever non-scale airframe was handy are far behind us. The rapid evolution is directly tied to innovation. How much of this innovation was captured at this event?—an overwhelming amount; trust me! On the final day, the speed event had three finalists going through the traps at over 210mph! Chris Huhn drove his BVM* Aggressor III to a winning speed of 220.8mph. Think about it: 220mph from a 4-foot-span model propelled by an engine of less than 1ci displacement turning a 4½-inch-diameter fan rotor!

Equally impressive, in a different vein,



Right: two black Yellow Aircraft VX-4 "Playboy Bunnies" showed up—one each by Kurt Wurster and Ron Spencer. Hi-Viz orange squares added to leading edges to aid visibility and orientation.

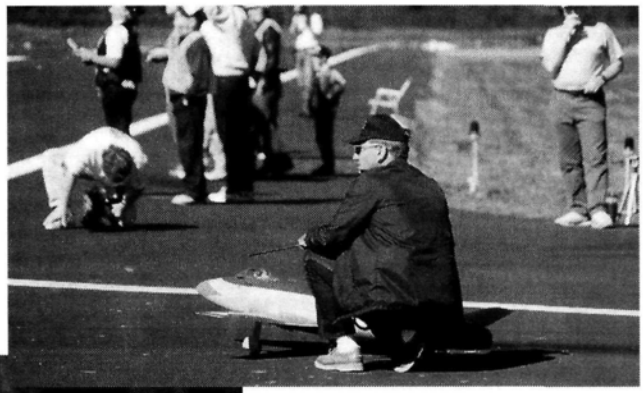


A free bottle of Zap goes to the first reader who correctly answers these questions: who is this man? What does he do for a living? What is he flying? Why is he smiling? What incredible feat did he perform at the Fan Fly?

was Dave Ribbe's electric-powered scale MiG-15. This 57-inch-span, 7-pound model used an Astro Flight* 40 motor driving a reworked Viojet rotor. Energy came from a 20-cell pack, and the performance was amazing, but eerily quiet! Dave usually waited until a lull in the activity so the sound of the high-revving nitro burners wouldn't drown out the barely audible whir of his red-and-white MiG. If you think you recognize Dave's name, you might have seen it on a plan sheet from some of the newer Top Flite* kit releases. He's one of their designers, and he sure has a lot of talent. Does this mean you might be able to run down to your nearest hobby shop in the near future and buy your own TF Electro-MiG? I doubt it, but it might be worth giving them a call!

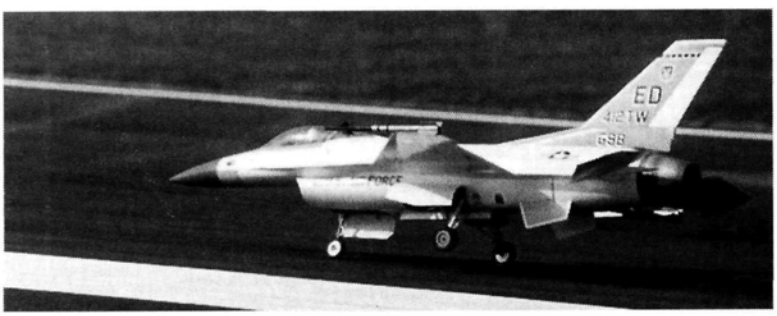
Giving a clear indication that all performance gains aren't necessarily powerplant related, Larry Jackson equipped his BVM Viper with a variable-geometry exhaust nozzle whose position was controlled by an onboard sensor. Larry clocked 213.9mph through the speed traps and feels that the nozzle system is contributing to the performance. Further development and refinement is under way.

Development has also taken place at SWB Turbines*, where Jeff Seymour has reduced the size of his previous unit and is introducing the SWB-4 version. This 4.75-pound marvel is only 4.5 inches in diameter and 10.5 inches long, but it produces 20 pounds of static thrust at 112,000rpm. It burns kerosene, which makes it safer and less expensive to operate than the propane-fueled variety; but I'm not sure that operating expense will be of concern to the well-heeled purchasers who part with the four grand it takes to be the first on their block. Understand, however, that this really is a bargain when you consider what it cost to develop, produce and bring the unit to market—especially considering the relatively small number of potential purchasers (an O.S. 40FP it ain't!). Jeff had the unit installed in a Jet Model Products* (JMP) T-33 that had suffered a minor tailpipe blowby just before the meet and was



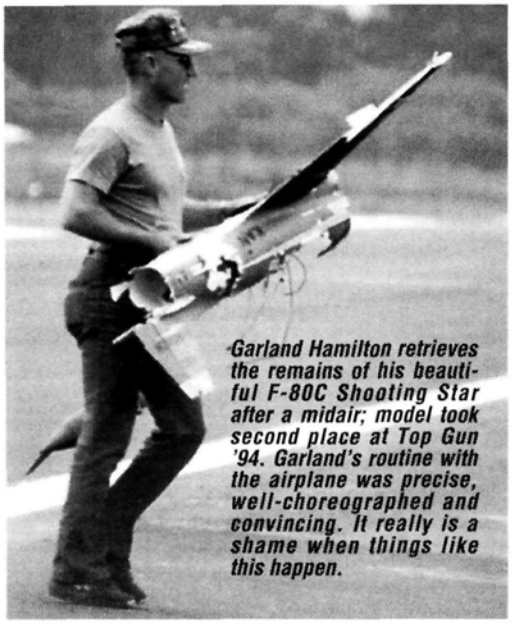
Above: Mike Kulczyk awaits clearance to release his Supermarine Attacker being flown by Bill Kinney—unusual subject; beautifully built.

Left: one of the stable of BVM machines: an F-86 converted into a Navy FJ-3 Fury. Subtle changes (cannon ports and flattened stab) don't seem to affect flying qualities and open a new world of color schemes!



The narrow-track gear of the F-16 raises the pucker factor in crosswind landings, as discovered by Chris Huhn. This was as far over as it got!

Unusual subject: the A-6 Intruder, nicely done by Les Burfiend from the Mey's Hi-Tech kit; O.S. 91 driving a Dynamax; 13 pounds.



Garland Hamilton retrieves the remains of his beautiful F-80C Shooting Star after a midair; model took second place at Top Gun '94. Garland's routine with the airplane was precise, well-choreographed and convincing. It really is a shame when things like this happen.

unable to fly. By now, I'm sure that the T-Bird has a good number of impressive flights on it and that Jeff has compiled sufficient performance data to release "real" numbers on his turbine.

MODEL MIX

As you might expect, most of the jets were built from kits—mostly BVM offerings. T-33 T-Birds "built" from Tom Cook's JMP kits were on hand in a variety of colorful livery. This kit represents the highest level of prefabrication available in any jet kit today: it's virtually *all* composite; glass and carbon fiber make up most of its well-executed airframe. Its size seems to indicate a trend towards larger, easier-to-see models being flown at more scale-like speeds.

Advancing this trend in the scratch-built world are Mike Kulczyk's outstanding F-84G Thunderjet (80-inch span; 22 pounds), Dick Rutkosky's superb F-86E Sabre (72-inch span; 25 pounds), Mark Frankel's batlike F4D Skyray (58-inch span; 20 pounds) and Jim Smith's attractive F9F Panther (56-inch span, 21 pounds) built from Ziroli* plans. Bear in mind that all of these bruisers used off-the-shelf fans and engines, none of which exceeded .91ci of displacement!

Dick Rotkosky puts the starter probe to his scratch-built F-86. This Sabre is both big and beautiful. The heaviest single-engine model at the meet (25 pounds), it nevertheless performed extremely well and sure didn't appear to be underpowered.

Which other scratch-built jets caught my eye? Well, from years of attending jet meets, I've learned that John Carlson can *always* be counted on to show up with something different. His past projects include a Douglas X-3 Stiletto, a Saab Gripen and a large MiG-21—not exactly your everyday choices for jet subjects, right? Well, he's at it again with a Navy bird that didn't make a lot of friends in the full-scale world but sure makes an interesting model: the McDonnell Douglas F3H Demon. This 1950s-vintage fighter had great proportions, a generous wing area and pleasant lines. It also had an inlet system which, though aesthetically appealing, could make a guy building a model of it pull out his hair. John's locks looked intact and his Demon did fly, so it appears that he has solved a lot of the problems. I can't wait to see what his new project might be!

Other interesting subjects included the Top Gun Aircraft* F-15, which appeared in fair numbers, and another Eagle, designed by Phil Avonds of Belgium and distributed in the U.S. by Aeroloft Designs*. This midsize model has a 58-inch span and weighs in the 15-to-17-pound range. The three examples I saw were built by fan vet Mike Lesher, Lynn Elston and Richard Fong, who used the colorful F-15 Demonstrator (red, white and blue) scheme on his model. This Eagle seems to be extremely accurate, it flies well and, with the friendly feature of single-engine operation, it should prove to be an even more popular kit in the future. Adding to the "Eagle Country" image, was yet another F-15, this time, the tried-and-true Byron Originals* variety, ably driven around the patch by Louis Patton. This 28-pounder used Byrojet fan units driven by K&B* 100 engines that seemed to perform fairly well.

A "SUPER" SUCCESSFUL EVENT

What I've tried to present here is the *airplane/flight line* side of the event, but what made the gathering even more successful was the camaraderie of everyone in attendance. The "pizza bash" hosted by Jerry and his wife made it even easier to exchange ideas and information. More than one newcomer to ducted-fan activities went away with the feeling that he was no longer in an information vacuum. Designers, builders, manufacturers and fliers—all willing and eager to share their experiences with one another. Sure makes it a lot easier for the new guy who frequently has a tough time separating the "heads up" from the hearsay.

With a format like this, the interest in the growth of jet modeling and the support the event is receiving, it's pretty safe to conclude that Superman '95 will be even better. Make plans to attend; you'll come away convinced!

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

FANTASTIC PHANTOM

The newest Rhino on the block: the F-4 Phantom. This "N" version was built by Bob Violett himself and flown in the team event at Top Gun '94. Very impressive product!

I mentioned that the BVM products dominated the kit-built entries. Say what you will about the beautiful F-80s typified by Garland Hamilton's crimson Kansas Air Guard rendition, the colorful JASDF F-86 produced by Frankie T., the business-like scheme of Tom Robertson's F-16 and the many other superbly executed examples of BVM kits, the one that really rang my chimes was the newest, the F-4 Phantom. It was the airplane Bob Violett flew in the team event at Top Gun '94. Paying attention to every detail—mechanical and cosmetic—really paid off. Jerry Caudle handled the building and finishing chores in his inimitable fashion, and the engines were so "synched" that, by sound, it was hard to tell that it was a twin. It was, however, easy to tell by performance: the model easily powered its way through vertical maneuvers and large, round loops—truly an impressive airplane!

GOLDEN AGE

HAL DeBOLT

R/C RECOLLECTIONS

RECENTLY, in our discussion of R/C plane evolution, we talked about the advent of biplanes. Charles Shafer of Mt. Union, PA, adds a photo of his recently completed Live Wire (LW) Custom bipe. Charlie's friend (and can't we all use many of those?) gave him the plans, which he had from a kit that he had used in 1958. Charles scratch-built his plane, and he's very happy with its performance. He powers it with a "weak" K&B engine, which has proved to be more than enough. That's easy to believe when you consider that the original did well with a '50s-vintage .35. What struck home is that the modern paint and trim make the oldie look almost modern!

Apparently the word is out that I'm working on a replica of my World Champ bipe (Swiss bipe?), and that has instigated calls from people requesting the plans. I'm sorry that I can't help anyone right now, but I hope to complete the project soon and to write a construction article that will include the plans. It's something to look forward to!

NEWS FROM OVERSEAS

Do you wonder how OT R/C is doing overseas? We have some news from John Wilson of Hertfordshire, England. John is a lifelong member of the West Essex Aeromodelers, whose current claim to fame is a fleet of OT Northrop Big Johns, which they fly in formation—slow and easy helps! John built a half-size Big John (Little John), and he can't understand why his doesn't have the big one's docile habits. Could it be the old "size syndrome"—or the Reynolds effect? That English club was started way back with LW Trainers and Champs; it's a small world! John says that his Champ is controlled by an F&M relay receiver, which he obtained from Dave Platt before Dave left England to join us here.

John took his 30-year-old Gee String (remember that one?) to a major English OT meeting. It still runs so well that almost everyone flew it, including Doug Spreng and Frank Van den Burgh—both of whom should provide this column with memories of good times.

How about the rest of the *Model Airplane News* readers worldwide? We sure would like to hear about OT R/C from your neck of the woods!

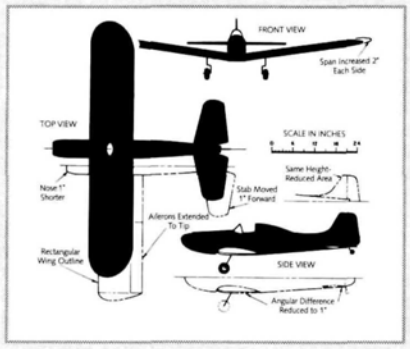
TWIN-STICK TRANSMITTERS

John Perkins of Slidell, LA, wonders why, with control-line (CL), we first

HELP REQUESTED

A letter from Bob Dunham's delightful wife, Yoko, informs us that Bob has had a series of strokes and heart attacks, which have left him incapacitated and nearly blind. You can imagine what this has done to the "go-go" character Bob has always been. I'm sure he would enjoy hearing from old friends.

I'd like to make a request of the OTers from the '50s and '60s; if you were involved with Orbit in any way, I know that Bob would very much enjoy receiving a short note (maybe book length!). His address is: 2490 Beverly Glen Dr., Lake Havasu City, AZ 86403.



Dunham's Astro Hog modifications could be applied to the Sig replica.

For those of you who don't know him, Bob is a genial, soft-spoken, down-to-earth modeler who was R/C's "Top Gun" in the '50s and early '60s. He's the model airplane world's perennial national champion, and he has promoted R/C relentlessly. Bob was at his best when he competed with his Smog Hog and his Astro Hog; he made them "talk" like no one else could. His black boxes dominated worldwide for years, and his Orbit reed systems were outstanding; the best fliers had to have them. Always a front-runner, Orbit introduced a reliable proportional system with their version of the Space Control concept, then they brought us into the modern age with a then-new, digital system. R/C lost a lot when Bob decided to leave the electronics field and go into the injection-molding industry.

Bob Dunham out-dueled his world champion teammates at the '60 Detroit Invitational.

So let's encourage this fine gentleman who has done so much for R/C and us.

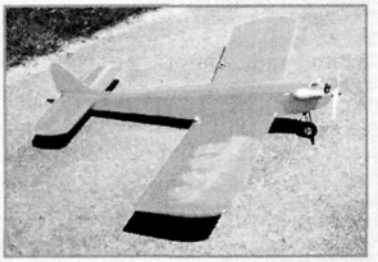
SELINSGROVE

This '94 Selinsgrove activity photo shows a wide variety of OT designs.

Charles Schafer's LW Custom bipe looks modern.

Even the memories of those first Selinsgrove events fill me with awe. It was the gathering of the clan—the who's who of early R/C. You had to have an invitation to attend this event, which still takes place at the lonely, grass-strip airport; and the invitations were tough to come by! The attraction must have been great, considering that Jim Walker traveled all the way from Oregon just to be there!

The '94 session may have been the last at the original site, which has become a rather busy airport. The site's fine amenities have brought increasing numbers of entrants and spectators these last few years; it's now a far cry from the first events, when you had to drive up a dirt path to get to the strip, and the only action you saw was at the ends of that strip. Arm waving was the only way to signal back and forth as the tuning procedure was attempted! Some brilliant flying did take place—by such fliers as Walt Good, Maynard Hill, Fran McElwee, Howard McEntee, etc. You *learned* at the 'Grove!



Art Schroeder's last-minute-effort LW Viscount—good show!

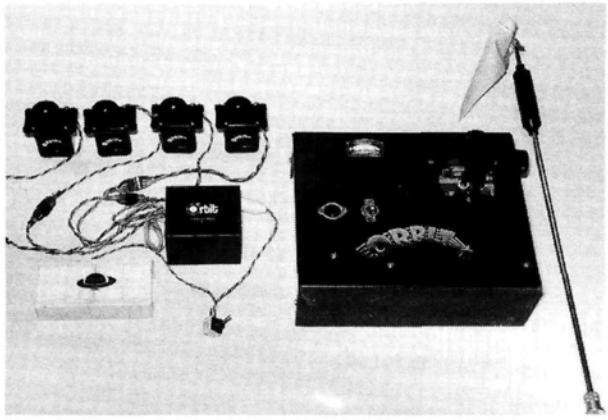
With nearly perfect weather, the '94 session had more than 40 fliers who performed more than 200 vintage flights; several individuals logged nearly 20 each. It has been said that there was a greater variety of vintage models in '94, including those of the LW series. Charles Chamos won the Spirit of Vintage award for his exacting rendition of the Rudder Bug, which he flew with vintage R/C—including escapements. Competition winners were: Class I—John Stare (Mac 17); Class II—Weldon Smith (Talon Zephyr); and Class III—Hal Parenti (model unknown).

Newsletter editor Art Schroeder exemplifies the spirit of Selinsgrove; he had spent the two weeks before the event in his workshop assembling an LW Viscount, and with the help of Bob Kopski, was able to declare it ready for flight the night before it was to fly. Art's effort and the Viscount's performance were greatly admired!

Be aware that Bob Noll and the Endicott Aeroguidance Society have scheduled a vintage R/C meeting for June 10 to 11, 1995, at the Sayre, PA, airport. You'll really enjoy it!

Charles Chamos with his award-winning Rudder Bug and LW Senior.

Bob Bingaman has a penchant for giant-scale OT R/C; this a 150-percent LW Cruiser.



The Orbit analog propo systems laid the groundwork for modern R/C.

flew clockwise to take advantage of engine torque, but we now fly counterclockwise. The answer is simple; it's the "follow-the-sheep" syndrome—Jim Walker flew counterclockwise.

Second, he wonders why we use a two-stick Mode II transmitter rather than a single-stick Mode II transmitter. Well, how R/C got started offers a clue or two. Early on, people flew their planes with single-stick, hand-held reed transmitters that had ground-based units and separate control boxes. The boxes used gimbals that resembled today's transmitters. Unlike today, a lot of "stuff" had to go into the reed transmitter case, but room was minimal if you wanted it small enough to be hand-held. By using separate, simple, toggle switches, bulky gimbals were unnecessary. The number of necessary switches, however, required that you use two hands to operate them. Because most modelers favored the hand-held units, they were forced to use two hands to fly.

By the time Dunham envisioned his first propo system, he felt that it would appeal more to the majority if it had a two-stick configuration; other manufacturers quickly followed the leader. The original concept was a Mode I that had the rudder and elevator on the left stick and the engine and ailerons on the right stick. It wasn't long, however, before fliers recognized the advantages of having the ailerons and elevator together on the right-hand stick; thus, Mode II became more popular.

Although two-stick transmitters are economical and convenient, the single-stick still has practical advantages. Single-stick transmitters are so rare today, though, that it seems as though people don't recognize the advantages they offer. For example, a properly arranged single-stick transmitter has the engine and trim controls conveniently on the back, right-hand side or on the top of the case for the left-hand fingers to operate. To use this transmitter, the case is cradled on the left forearm with the left fingers around the case's right rear corner; this way, you have a finger for each lever that controls the engine and the trims. The major advantage should be obvious: the plane is flown with the right hand only; you don't have to remove your hand from the control stick to change trims or engine speed; you do that with your left hand. Suppose you're holding a bit of aileron and elevator with the control stick to maintain straight and level flight. With this transmitter, it's no sweat to dial in the necessary trims without removing your hand from the control stick. It's especially useful for patterns where a quick, simple trim change can make a difference in a maneuver's entry. It's something to consider.

Some prominent fliers make the extra effort that's required to gain the advantages of using a single-stick transmitter, while the vast majority stick with Mode II. Yet both win championships! You'll have to ask someone who flies with a single-stick transmitter how they accomplish all the "bells and whistles"!

Remember, this is your OT R/C place! ■

HOW TO

Tailless Airplane Design Part 2

A study of the five major tailless designs

by ANDY LENNON

OVER THE YEARS, many tailless aircraft (or flying wings) have been developed. The study and analysis of typical full-scale designs will highlight the problems faced by their designers and the resulting solutions. Such a review is of interest to would-be tailless-model designers.

Tailless airplanes can be classified into five major configurations:

- plain;
- swept back;
- combined plain and swept back;
- delta;
- swept forward.

I'll deal with each category.

PLAIN

Figure 1 is a three-view drawing of the Arnoux "Simplex"—a 1922 racing monoplane, which was powered by a 320hp Hispano-Suiza engine. Its top speed was 236mph and its landing speed a brisk 84mph. It crashed during a test flight before the Coupe Deutsch.

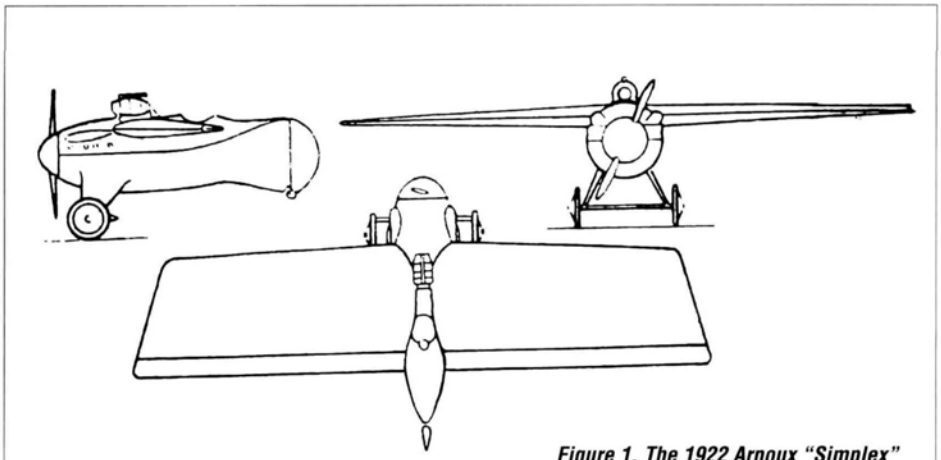


Figure 1. The 1922 Arnoux "Simplex" racing monoplane designed by Carmier.

Flight controls were elevons and rudder, and the airfoil was a symmetrical Goettingen 411. The very short tail-moment arm from the CG to the elevons must have made longitudinal control and CG location very sensitive; stops restricted the downward movement of the elevons. Roll and yaw control was satisfactory, and the structure was good. To obtain the correct CG, a tractor engine and propeller were the only choices. The major disadvantage, longitudinally, of the plain wing is the short tail-moment arm.

Obviously, lower aspect ratios with the resulting longer chords would be an improvement. Coupling low aspect ratio (AR) with heavy taper results in even longer central moment arms.

Figure 2 illustrates the concept—the

Figure 2. The 1935 Fauvel A.V. 10 tailless light airplane.

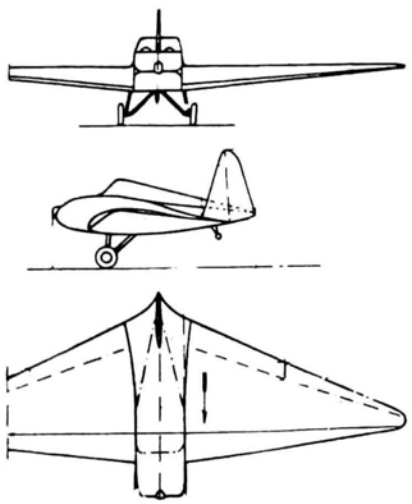


Figure 3. Hoffman disk-type airplane.

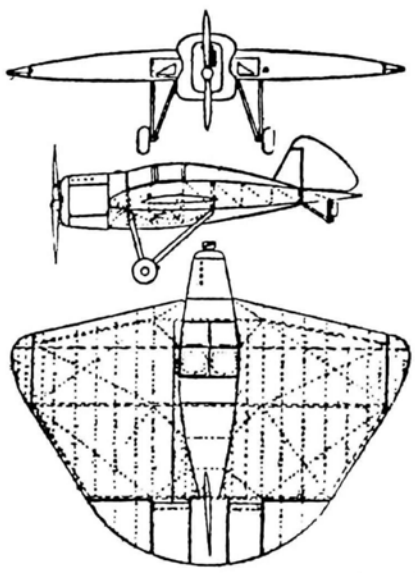
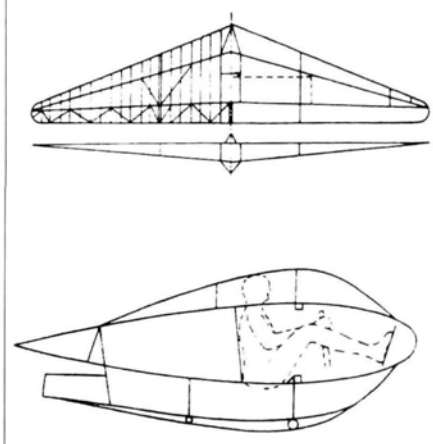


Figure 4. The Horten brothers' first "flying wing" sailplane of 1933.



Pilot's accommodation

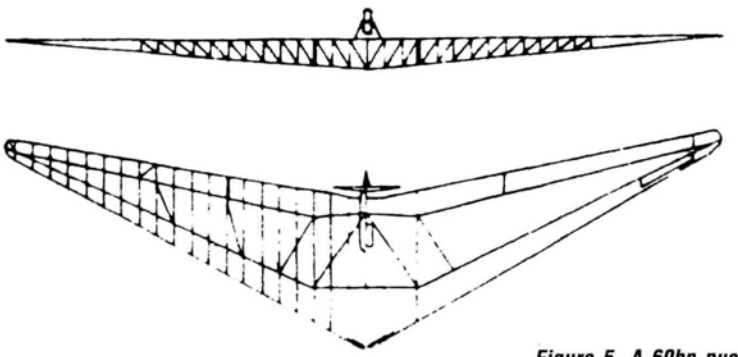


Figure 5. A 60hp pusher prop on a Horten glider.

Fauvel A.V. 10 of 1935. Powered by a 75hp Pobjoy engine, it had a sharply tapered wing with an AR of 5.4. Its airfoil was heavily reflexed, without washout, and uniform across the span. Inboard trailing-edge elevators provided pitch control; outboard ailerons provided roll control; and a rudder controlled yaw.

The A.V. 10 performed well and was granted a French certificate of airworthiness, but no further developments occurred. Structurally, the wide, thick wing was light. A tractor engine and prop were the only choices.

The low-AR, wide-chord configuration was developed into the Hoffman disk-type airplane shown in Figure 3. The airfoil was a stable, reflexed M-section; the ailerons were the wingtip, floating variety; the elevators were inset at the semicircular trailing edge, and a large vertical surface was provided. An 85hp tractor engine and prop were used. It flew well, but no further developments took place.

Low-AR wings do not stall until they reach high angles of attack; and the danger of spins is remote. Slow, safe, landings at high angles of attack are possible. The Hoffman's long main landing gear reflects this capability.

In R/C model terms, the tailless plain wing concept is alive and well in Bill Evans' "Simitar" series.

SWEPT BACK

Sweepback (SB) favors higher aspect ratios. For a given angle of SB (measured on the ¼ chord line), higher ARs result in longer tail moment arms for better longitudinal control. Higher SB angles have the same effect but result in lower lift.

High ARs demand greater strength and higher weight. Also, sweepback induces twist under flight loads, and that tends to reduce the wingtip's angle of attack. Good, torsional stiffness is required to remedy this.

During the '30s, the German Horten brothers developed a series of flying wings as shown in Figures 4 and 5.

The Horten flying wings had:

- thick, sharply tapered planforms of symmetrical airfoil sections;
- washout toward the wingtips;
- elevators inboard and ailerons outboard on the trailing edges;
- yaw control that was provided by air brakes placed outboard on both the top and bottom surfaces, flush with those surfaces when not being used. No vertical surfaces were used.
- dihedral on the lower wing surface;
- a cabin arrangement that, in later models, required that the pilot lie in a prone position, completely enclosed in the wing.

One version had an enclosed 60hp engine driving a pusher prop on an extension shaft (Figure 5). For R/C models, an electric motor enclosed in the wing, with an extension shaft, driving a pusher prop at the wing's trailing edge would be practical.

Figure 6 illustrates the Buxton glider of 1938. This interesting design had a thin, high-AR wing, symmetrical airfoils washed out to the wingtips, and vertical fins and rudders at the wingtips. Outboard elevons provided pitch and roll control. The pilot was housed in a pod below the wing. Small split flaps were used at the wing roots.

A more recent flying-wing design, the Davis Wing, is shown in Figure 7. It incorporates the design features of the ill-fated Northrop flying-wing bombers of the '40s. It also bears a close resemblance to the

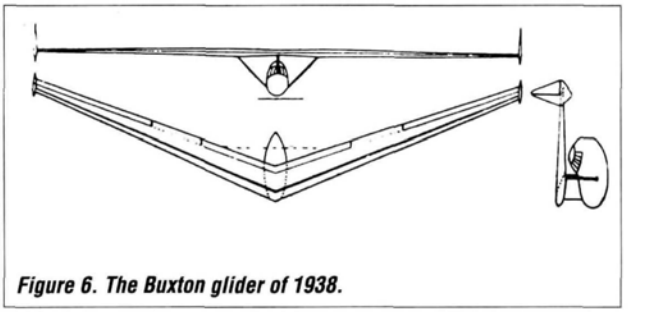


Figure 6. The Buxton glider of 1938.

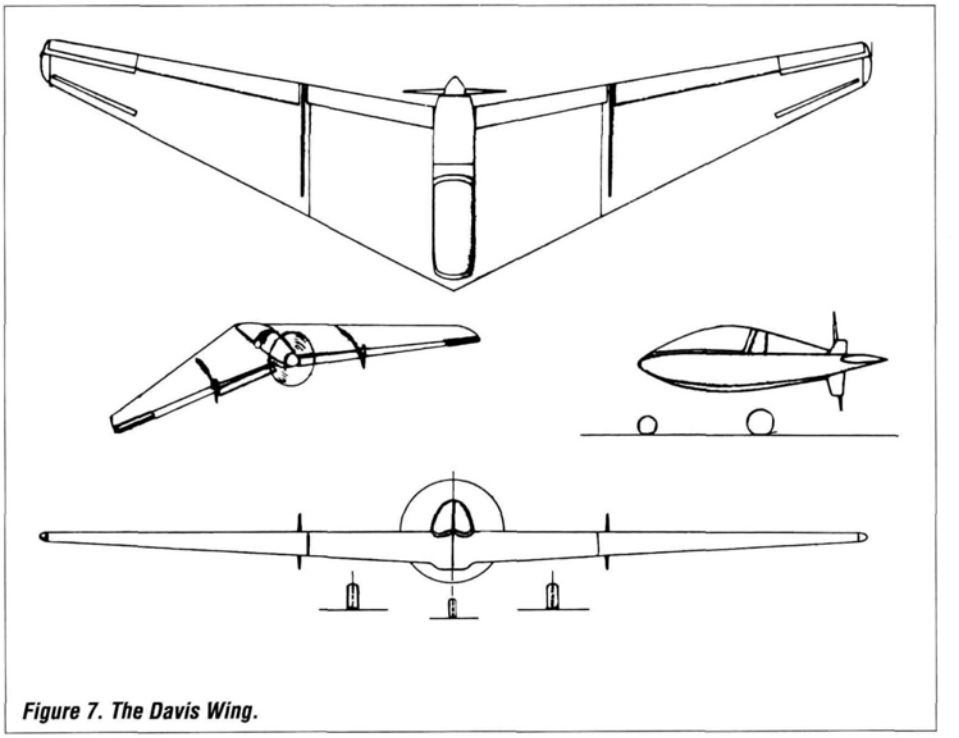


Figure 7. The Davis Wing.

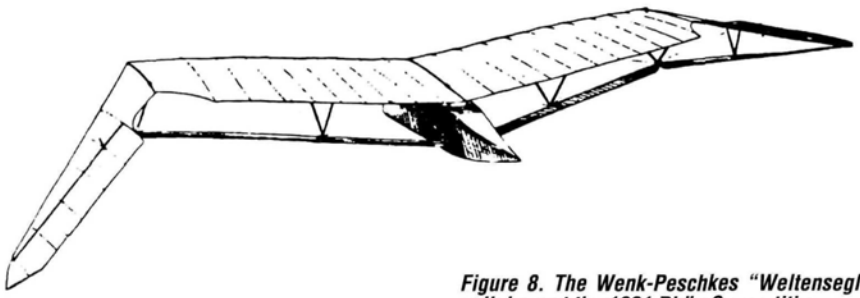


Figure 8. The Wenk-Peschkes "Weltensegler" sailplane at the 1921 Rhön Competition.

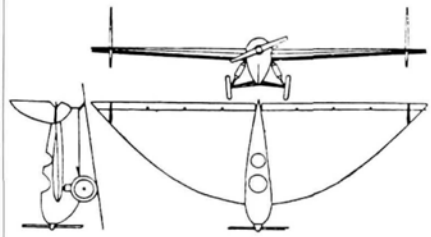


Figure 11. The Tscheranowsky-Gruhon "Parabola."

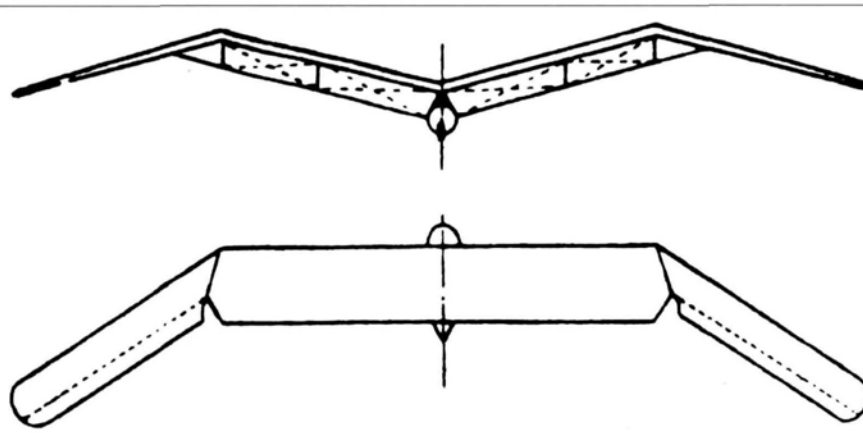


Figure 9. Wenk-Peschkes "Weltensegler" sailplane (1921 type).

Horten designs.

The engine is a 65hp, water-cooled Rotax 532, in a well-streamlined pusher installation.

This wing had an AR of 6.67, a surprisingly large wing area of 240 square feet and a gross weight of 975 pounds for a wing loading of 4.06 pounds per square foot (low for a powered full-scale light airplane). A Cessna 172 weighs 2,300 pounds, has 174 square feet of wing area and a wing loading of 13.2 pounds per square foot.

The Davis's top speed was a brisk 150mph—excellent, on 65hp; stall speed was a modest 42mph, thanks to its low wing loading. Its empty weight was 565 pounds, so it carried 73 percent of its weight as useful load.

The wing is sharply tapered and swept back 28 degrees on the ¼ chord line. Controls consist of split-drag rudders outboard and elevons inboard. Wisely, the narrow tips are equipped with fixed leading-edge slots to delay wingtip stalling. Obviously, the pusher engine and prop are best. No dihedral is needed on swept-back wings.

Richard Engel's "Winglet" *(Model Airplane News,* March, 1994), powered by a pusher .40 and with a wing area of 900 square inches, is a good example of a flying-wing design.

COMBINED PLAIN AND SWEPT BACK

Figures 8 and 9 show the 1921 Wenk-Peschkes "Weltensegler" sailplane. This design illustrates the combined plain and swept-back wing planform, with a rectangular, dihedralled center section and anhedralled, swept-back, outer panels. The outer panels are set at lower angles of attack to provide the download to balance the forward CG. Controls were on the trailing edge of the outer panels.

These outer panels, like an inverted vee-tail, provided both horizontal and vertical surfaces. The elevons acted, in concert, as elevators; but differentially as ailerons. The downswept controls also acted as rudders into the elevon-induced turn, thus overcoming any adverse yaw.

As Figures 8 and 9 illustrate, the wing was externally braced, it had an AR of 11, and it weighed a low 93 pounds for a span of 53 feet and an area of 195 square feet. It flew successfully, but later broke up in flight, causing the pilot's death.

Figure 10 portrays a British project: the Handley Page-Lachmann twin-pusher-engine tailless. This craft had the combined plain and swept planform, but with large vertical surfaces at the wingtips. This com-

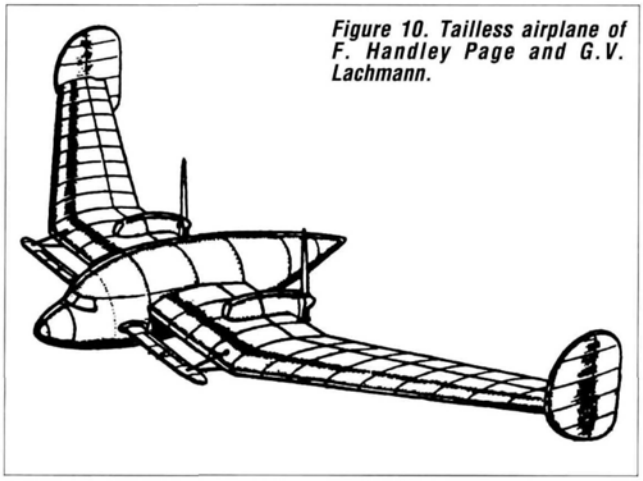


Figure 10. Tailless airplane of F. Handley Page and G.V. Lachmann.

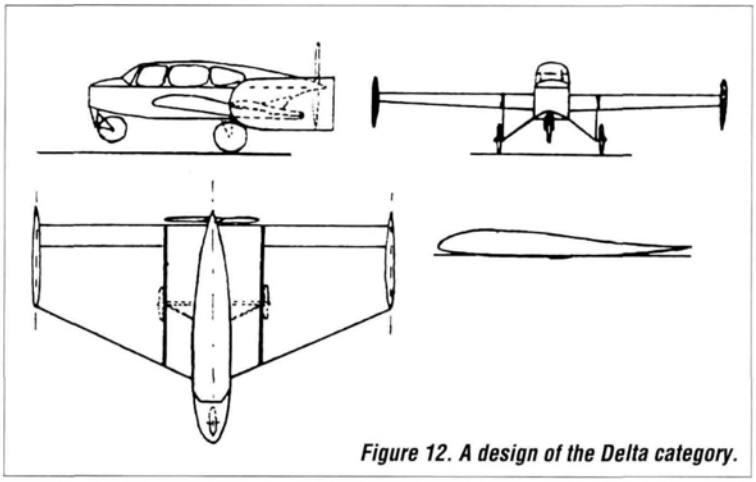


Figure 12. A design of the Delta category.

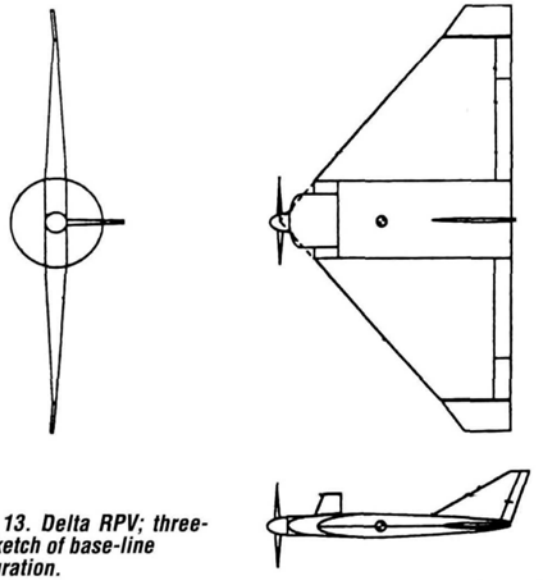


Figure 13. Delta RPV; three-view sketch of base-line configuration.

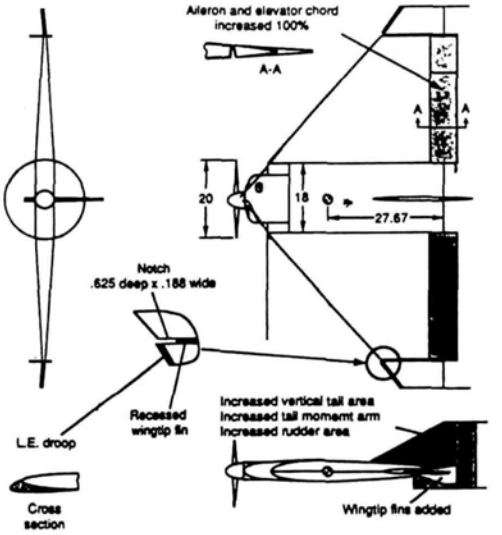


Figure 14. Delta RPV configuration modifications.

pensated for the fuselage and countered an "engine-out" situation.

The tab on the floating airfoil in front of the main plane is coupled with the landing flaps to counteract the nose heaviness caused by the deflected landing flaps. The advent of WW II probably stopped further development of this interesting design.

DELTA WINGS

The delta planform has the advantage of flying to very high angles of attack before stalling. High-lift devices are neither practical nor needed on this type of wing.

Over the years, many delta-wing designs have evolved. Figures 11 and 12 illustrate two such planes. Figure 11 is of the Tscheranowsky-Gruhon "Parabola," which was built by the Z.A.H.I. in 1931. Its wing section had a thickness of 7.7 percent. Figure 12 shows a design that might raise problems with lateral stability–the 1930 Abrial A-Viii light airplane. It was powered by a 95hp engine; it had a 22.4-foot span and 173 square feet of wing area; and it weighed 1,320 pounds. Note the reflexed airfoil.

Figure 13 illustrates the original configuration of a Delta RPV (remotely piloted vehicle), which underwent wind-tunnel and flight tests at the Langley Research Center in Virginia.

Figure 14 shows the modifications resulting from wind-tunnel tests, confirmed by subsequent flight tests. Note the NASA leading-edge droop *(Model Airplane News,* June 1990—NASA Safewing) and RAO slots on the outboard wing panels to improve stall resistance. An R/C model based on the modified design would be an interesting project. The low AR, wide chord and thick airfoil result in a light, strong structure. Obviously, a tractor power unit is required; a pusher installation would present serious problems in correctly positioning the CG.

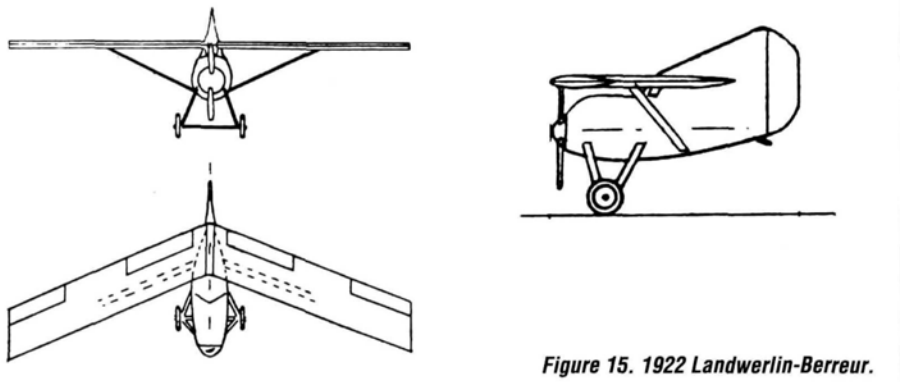


Figure 15. 1922 Landwerlin-Berreur.

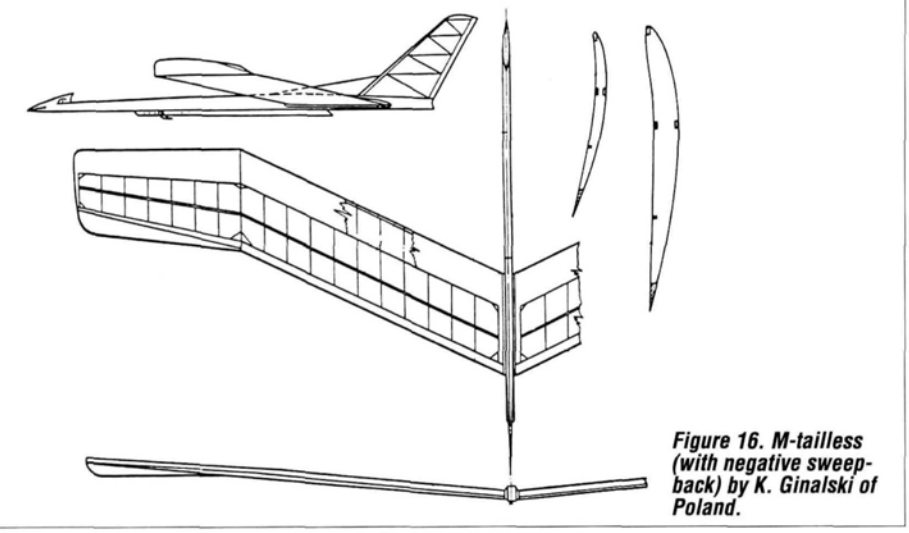


Figure 16. M-tailless (with negative sweepback) by K. Ginalski of Poland.

SWEPT-FORWARD WINGS

As discussed in Part 1, few swept-forward tailless airplanes have been developed. Figure 15 shows one such design—the Landwerlin-Berreur racing monoplane of 1922. This aircraft featured separate elevators and ailerons and a very large, vertical, low-aspect-ratio tail fin. It was powered by a 700hp engine.

Figure 16 (from an *Aeromodeler* annual) shows a swept-forward, tailless, free-flight model. Note the heavily cambered airfoil sections and the large vertical surface.

Part 3 will consider control features for tailless designs. ■

FOR SALE: a model engine collection with 20 engines of all displacements. Write to: Udo E. Linke, Caixa Postal 24, 18130-000 - Sao Roque - S.P., Brazil. [7/95]

PATTERN SHIP—Deluxe MK-Arrow, SuperTigre .61-RE, tuned pipe, Rhom retracts, bottle, eng/jig. Wings and fuselage framed, straight! All new in box! Terrific entry-level aircraft for juniors. First $325 takes all. Shipping. (503) 535-2246. [5/95]

ARE YOU INTERESTED IN FUN-FLY COMPETITION? Join the NCFFA for guidelines and events in both traditional fun fly and timed stick/boom-type aircraft contests. Membership is $10 for card, logo and informative newsletter. Send to NCFFA, Tom Holms, 9 Jervy Rd., Greenville, SC 29609. [5/95]

PLANS ENLARGED—Scanning/plotting services, old model magazines, computer software, free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464. [5/95]

WANTED: Concept models kit for .40 Beechcraft Travelaire 2000. Must be complete. Bill Wyse, 4335 Marina City Dr., #1140 ETS, Marina Del Ray, CA 90292; (310) 822-2442. [6/95]

CASH FOR TOY METAL Outboard Boat Motors: Gale Soverign, Johnson, Mercury, Oliver, Sea-Fury, Evinrude, Scott-Atwater, also want tin wind-up toys, toy trains, pre-1960 comic books. Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; ph. (616) 941-2111. [5/95]

WANTED: Midwest RK-049 fan unit, or any fan to fit 049 engine. Also wanted: Cox car kits pre-1980. B. Sperle, Box 1552, Unity Saskatchewan, Canada SOK 4LO; (306) 228-3629. [6/95]

FOR SALE—One KP656 series 77 with 7 S-15's. One KP7L 78 receiver. One KPT4A sport with 4 S-15's. One Sanwa Cox 3 CH. 8003 with 3 80421 servos. Various mounts, connectors and support equipment. Package $200. (334) 393-1642. [6/95]

MODEL COLLECTOR—For sale, large collection of models (40's, 50's, 60's, U/C, R/C, F/F, solids); trades possible. Call or write (SASE) for list: Dr. Frank Iacobellis, 62 Palisane Rd., Rye, NY 10580; (914) 967-5550. [7/95]

R/C AERIAL PHOTOGRAPHY—From the makers of "R/C Airborne Videos," by Adrian and Hugh Kingsford—Plans of proven camera-carrying model aircraft. "PTERODACTYL" (Hand-launched), "LOF-TUS" (Multi-role surveillance), PHOENIX MK II (14-foot span)! Send U.S. $5 for info to: 12 Toru St., Mapua, Nelson, New Zealand. ph.—(03) 540. 2577. [7/95]

GEE BEE PLANS (Delmar used). R-1, R-2, "Z." Seven more, 1/3, 1/4, smaller. Airplane goodies! Catalogue/News $4, refundable. Vern Clements, 308 Palo Alto, Caldwell, ID 83605. (208) 459-7608.[7/95]

ANTIQUE IGNITION engine parts: excellent reproductions, fuel tanks, points, timers, coils, needle valves, gaskets, etc. Champion spark plugs. Catalogue—$5 (intl. airmail—$7). Aero-Electric, 1301 W. Lafayette St., Sturgis, MI 49091. [10/95]

WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 1301 W. Lafayette St., Sturgis, MI 49091; (616) 665-9693, or (800) 982-5464. [10/95]

PAYING $75 EACH for toy metal outboard boat motors: Soverign, Oliver, Mercury, Johnson, Evinrude, Scott, Sea Fury Twin. Also buying tin toy robots, motorcycles, cars, foreign toy trains, pre-1950 comic books. Call collect (616) 941-2111. Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686. [5/95]

HOMELITE 25cc: New, aircraft conversion includes: prop hub, muffler, choke, primer, mount, solid-state ignition, $175pp. Doug, P.O. Box 406, Broad Brook, CT 06016. All inquiries answered.[7/95]

ELECTRIC HELI Kalt Whisper. With JR electronics. (Max 5, gyro, servos, etc.) Two batteries, charger—"The whole nine yards." Test flown only. $875; (404) 740-8275. [6/95]

FIGHTER ACES SIGNATURES—on portraits, aviation art, commemorative envelopes, photos and books—WW I and II—American, British, Luftwaffe and more. Leisure Galleries, 1375 N. Broadway #D-3, Escondido, CA 92026; Phone/fax (619) 745-0342, orders (800) 782-9567. [5/95]

FLAPERONS, ELEVONS, vee tails, wings, dual throttles, need the MicroMixer. Tiny 1/3 ounce. Airborne computer mixing for standard radios! Without connectors, $29 assembled, $21 kit, $2.25 shipping. Quillen Engineering, 561 N. 750 W., Hobart, IN 46342. [7/95]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [12/95]

may be an understatement) blimp hangars were truly awe-inspiring. The hangar that served as a backdrop to the flying looked as though it would interfere with the flights. But, prior to the official flights, the organizers and the Marine Corps performed a demo flight and reported that they came nowhere near the structure. It turned out that the hangar was well outside the competition area. (I still noticed some higher-than-usual figure-8s during the contest!)

The weather cooperated with a clear sky and only a few puffy, white clouds so that there was good pilot vision. Friday and Saturday were warm. Sunday was cooler and a little more cloudy and comfortably breezy.

Let's get to the actual competition.

JUDGING

Thursday's static judging was held in two large hangars at Chino Airport. The hangars provided plenty of room for setup and queuing as well as a place for shade. The judges were Darlene Fredericks, Norm Goyer and Jim McDonald, all of whom sat comfortably and coolly inside the hangars. The judging was intense, and it took place amid several full-size aircraft, which created a unique atmosphere. Among the "big guys" present were a Beech Staggerwing, a Grumman Hellcat, two AT-6s, a beautiful Cessna 195, a P-51D Mustang, an immaculate Piper Cub (not much bigger than some of the model versions I've seen lately) and a deHavilland Vampire carrier jet.

Competitors who were unable to make it out to Chino on Thursday were static-judged on Friday morning. Diego Lopez and Gordon Truax ensured that everything moved along as quickly as possible.

FLIGHT SCORING

Flying took place at the Marine Corps Air Station—an active helicopter base, in Tustin. Years ago, it was the U.S. Navy Lighter than Air base—home to several fleet blimps; in fact, most locals still refer to it as the "blimp hangars."

Official flights didn't start until 10 a.m. on Friday. Everything went smoothly, although there were a couple of stand-downs when full-size helicopters landed. During these landings, it was a good idea to hold your aircraft and awnings!

In the afternoon, we had to relinquish the field to the Marine Corps so that they could practice for the demonstration they would be performing for the public during Sunday's base open house.

There were the usual first-flight problems: a couple of competitors couldn't get their engines to run and had to pass their turn or skip the first round completely. On the first day, Diego Lopez's big Douglas Skyraider tried to take out one of the runway lights; the light survived, thanks to the careful and strategic placement of big, orange, rubber traffic cones. Diego's Skyraider also came out unscathed.

Scale Masters winner Terry Nitsch and his famous Minute Man F-86 Sabre Jet.

The only J-3 Piper Cub at the Masters belonged to "Big Jim" Pendergrass of Anaheim, CA.

There was a high standard of flying the first day, but it was nothing like the flying that took place on Saturday and Sunday.

THE JET SET

The seven ducted-fan-powered models were especially impressive. Although I am a biased, WW II, heavy-metal advocate, I was impressed by the strides that have been made in the power and reliability of ducted-fan aircraft; and the best of these aircraft were flown at this event.

Six of the top 11 finishers, including first, second, fourth and fifth, had ducted-fan planes. Only Diego Lopez's Skyraider, which took third, prevented the jets from taking first through fifth!

Dennis Crooks, with his Learjet twin, and Terry Nitsch, with his Bob Violett Models* F-86, were in top form, and they battled each other neck and neck throughout the competition. It was obvious, from the very beginning, that these two would be the pilots to beat.

I overheard one of the spectators comment that most of these planes were the same as last year's. It was true, to some extent; but I hastened to inform him that you don't come up with a Scale Masters- or Top Gun-quality plane in only a few months. With a new aircraft, even the best of fliers needs to practice, practice, practice.

Top 10 Masters, 1994

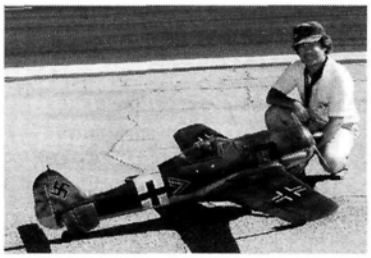
Pos.	Pilot	Model	Static score	Flight score	Total
1	Terry Nitsch	F-86 Sabre	97.50	93.250	190.750
2	Dennis Crooks	Learjet 35A	97.00	92.583	189.583
3	Diego Lopez	Skyraider	96.50	92.083	188.583
4	Jeff Foley	Lockheed T-33A	96.50	91.417	187.917
5	Shailesh Patel	F-14 Tomcat	96.50	90.417	186.917
6	Eugene Job	A6MA Zero	94.50	91.083	185.583
7	Gene Barton	Skyraider	93.00	90.500	183.500
8	David Hayes	Ayers Thrush	96.50	84.917	181.417
9	Roger Shipley	T-33 Mk III	93.00	88.167	181.167
10	Mike Barbee	DH 82 Tiger Moth	94.00	86.500	180.500

Additional awards

Pilots' Choice: Ernie Harwood—Proctor (Duncan Hutson) SE5-A
High Static: Terry Nitsch—Violett F-86
Best Military: Terry Nitsch—Violett F-86
Best Civilian: Dennis Crooks—Learjet 35A
Best Scratch-Built: David Hayes—Ayers Thrush (Crop Duster)
Best Plan-Built: Earl Thompson—deHavilland DH88A Rapide
Best Built-Up kit: Ernie Harwood—Proctor (Duncan Hutson) SE5-A
Best Engineering and Design: David Hayes—Ayers Thrush (Crop Duster)

David Hayes earned a respectable eighth place with his Ayers Thrush, which also won the Best Engineering and Design award.

Fourth-place Jeff Foley and his beautiful T-33A in the static hangar.



Paul Curley, from Hollywood, CA, and his big Focke-Wulf FW-190.

All the hard-working static and flight judges.

Seventh place was won by Gene "Mr. Retracts" Barton and his beautiful Skyraider.

WEEKEND AIR COVER

Saturday's flying started promptly at 9 a.m. There were, again, a couple of stand-downs, but things went smoothly. There was about an hour of demo flying around lunch time. These flights were topnotch, but I overheard many of the contestants comment that the time might have been better spent with continued contest flights.

I thoroughly enjoyed the military scale demos. It was great to see an enlarged Ziroli* B-25 (Nick Rivaldi) alongside a Byron* Corsair (Bill Vargas) that was flying top cover. It was also inspiring to watch a Ziroli C-47 (Nick Rivaldi) fly with a P-47 (Jerry Ortego). The two Zenoah* G-62s that hummed in unison and flew Chuck Collier's P-38 were awesome.

Shailesh Patel works on his fifth-place F-14 Tomcat—a big model!

Second-place Dennis Crooks, with his Learjet 35A. Dennis was 1993 Masters winner.

Sunday's flying was intense because, by then, it was obvious who was in the lead and what kind of scores were necessary to win. In the fourth round, Terry Nitsch flew a "mere" 90 and that gave Dennis Crooks an opening to get ahead; but Dennis earned a 90.5 and was unable to make up much ground. In the fifth—and final—round, Dennis outdid Terry 93.5 to 92.75, but it wasn't enough to overtake this year's U.S. Scale Masters Champion, Terry Nitsch.

Terry won with a total score of 190.750, and Dennis Crooks took second with 189.583. Dennis was the 1993 champion and had done his best to retain his title. Diego Lopez managed to squeeze into the middle of all the jet jockeys, and he took third place with a score of 188.583. Jeff Foley and his big Jet Model Products* T-33 finished in fourth with a score of 187.917. Fifth place was awarded to Shailesh Patel who scored 186.917 with his Yellow Aircraft F-14 Tomcat.

MASTERS GOLD

Around noon on Sunday, the top-10 finishers were announced, and then, starting with first place, the pilots chose the prize(s) of their choice from an impressive array of topnotch R/C items. It worked out well and was appreciated by the contestants.

The prizes were provided by Pacer, Yellow Aircraft (which provided a giant Spitfire kit) Airtronics*, Futaba* and JR Remote Control* (all of which donated a top-of-the-line radio), Proctor*, Lanier*, Robart, Hobby Shack*, and Du-Bro*. Vendor booths were manned by Hobby Shack, EMS Electronics*, Zurich Sun Glasses, Glennis Engineering* and Funkshun Graphics.

My favorite booth was the Miller Brewing Company trailer!

Demonstration flights were provided by Team Extra R/C Aerobatics and the R/C Aero Flight Team. (If I've left out any sponsors or volunteers, I give my sincere apologies.)

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

Contest Officials
Mr. Scale Masters: Harris Lee
Contest manager: Diego Lopez
Contest director: Gordon Truax
Chief judge: Kent Walters
Assistant chief judge: Bill Deverna
Chief sponsor: Pacer Technology
Hosts: United States Marine Corps

Static Judges
Darlene Fredericks
Norman Goyer
Jim McDonald

Flight Judges
Fred Browns
Wayne Fredericks
Jim Parker
Dan Parsons
John Richardson
Bob Richards
Dave Shwerian
Bob Sortor
Vernon Altamariano
Dave Voglund

Planes of Special Interest

Plane	Pilot	Engine	Length (in.)	Weight (lb.)	Radio	Other info.
Curtiss Helldiver	Bob Olson	Webra Bully	88	29	Futaba	Bert Baker plans; Gene Barton retracts.
Hawker Tempest V	Greg Singleton	O.S. BGX	77	22	Futaba	Scratch-built; Bob Holman plans; hand-mixed K&B epoxy paint.
SE5-A	Ernie Harwood	Saito 1.20	72	11+	JR Max	Duncan Hutson (Proctor) kit.
Super Corsair	Mel Santmeyers	60cc Stihl	72	28	Futaba	Byron Corsair; clipped-wing racing version.
deHavilland Rapide	Earl Thompson	K&B* .40	96	14	Airtronics	Scratch-built from R.C. Sweitzer plans.
F-14 Tomcat	Shailesh Patel	O.S. .91	85	35	Futaba	Servo-controlled swing wings; opening canopy; retracts; flaps.
Rearwing Skyranger	Eduardo Diniz Esteves	O.S. Gemini FT300	109	28	–	Sid Morgan plans, but highly modified.
T-33 Red Knight	Roger Shipley	BVM* .91	80	18	JR	Bob Violett kit.
Ayers Thrush	David Hayes	O.S. Max .91	82.5	13	JR	Original design; working liquid spray system.

*BVM—Bob Violett Models

Blocks, Blocks, Blocks!

Author displays expression of contentment—blocks, blocks, blocks!

Scrap-steel dies solve many building problems

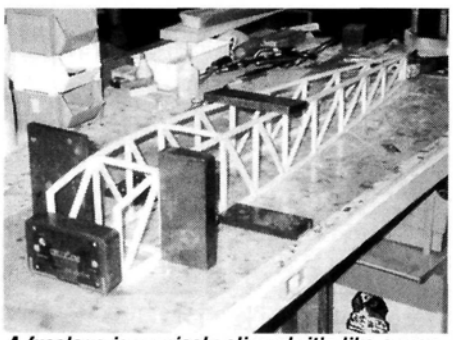
by JOE BESHAR

BUILDING CAN BE as enjoyable and as gratifying as flying, especially when you're practicing and perfecting precision-building techniques. A basic challenge is to achieve perfect alignment, i.e., square—or perpendicular—angles. It's a satisfying endeavor that I find works like adrenaline to encourage the completion of a project. Good building technique is just plain satisfying!

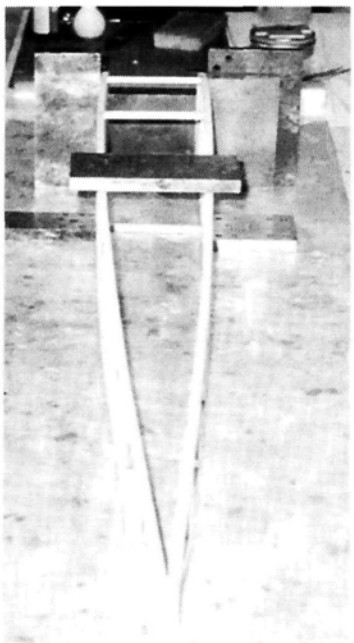
Modelers who visit me question why I have steel blocks of various sizes and weights in my workshop. They're usually surprised but impressed when I explain their use in "squaring" and tell how their weight can make them as valuable as a third hand. These blocks are also free. A picture is worth a thousand words, and I hope the few photos shown here convey their myriad uses.

• **Where do they come from?** These steel blocks are used stamping die blocks that have outlived their useful working lives. They're typically made of hardened tool steel, have precision-ground surfaces and are available in practically every size and weight.

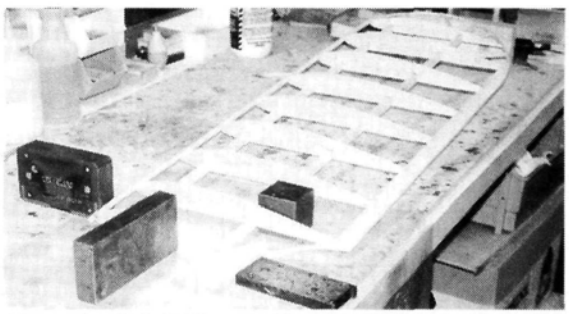
• **How do I get them?** It's simple: just go to a tool-and-die shop and ask. They'll be happy to give them to you because the blocks are usually discarded as trash. I hope the photos will inspire you to get on board with blocks, blocks, blocks!



A fuselage is precisely aligned; it's like a magnetic jig, but gravity is being used instead of magnetism.

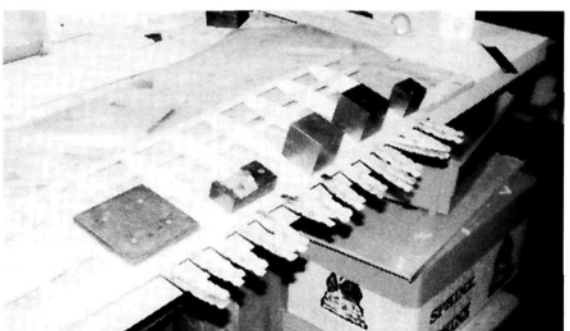


Bolcks at sides, top and right rear of fuselage provide perfect alignment.



The center rib is held perpendicular to the tabletop to ensure perfect wing-panel dihedral.

The wing panel is held in place for dihedral setting.

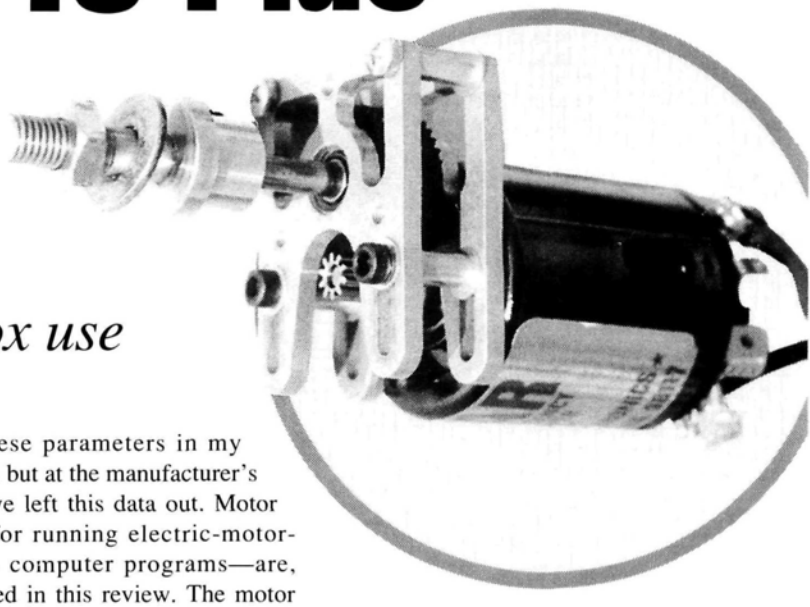


Blocks weigh down the trailing edge on the ribs while they're clamped until the glue has dried.

PRODUCT REVIEW

Model Electronics Turbo 10 Plus

BY TOM HUNT



Turbo 10 Plus motor and Super Box gearbox with 3.8:1 ratio (installed).

New 10-cell electric motor designed for gearbox use

MODEL ELECTRONICS CORP.* of Seattle, WA, has extended its line of high-powered ferrite motor/gearbox combinations to include the Turbo 10 Plus—a 10-cell version that's capable of swinging large props to obtain high thrust. This system is offered to power their P-51 Mustang and Japanese Zero to vertical performance.

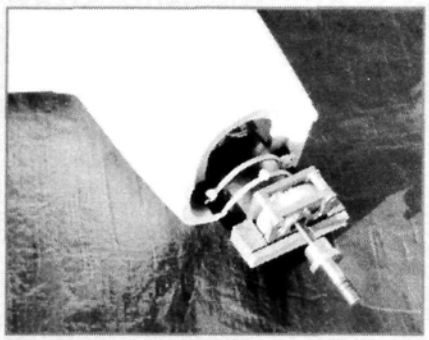
The motor is specifically designed to be used on a gearbox, and it turns in excess of 35,000rpm to obtain power. Therefore, a gearbox is the practical method of transmitting this power to a propeller. The motor looks similar to many of the available 05 "can" motors; however, its internal configuration—i.e., number of winds, wire gauge and number of wire wraps per slot—is the secret to its high power output. I usually state these parameters in my motor review, but at the manufacturer's request, I have left this data out. Motor constants—for running electric-motor-performance computer programs—are, however, listed in this review. The motor timing is adjustable, but it's set at the factory for maximum power when it's used with a gearbox. If you would like higher efficiency and longer flights with less power, the timing should be reduced to near neutral. The shaft is supported on ball bearings (a necessity because of the high rpm), and the brushes are replaceable.

SUPER BOX

The gearbox that's offered by Model Electronics for this motor is the Super Box. It's capable of handling in excess of 300 watts (0.4hp), and it's available in 70 ratios—from 1.3:1 to 8.0:1. It also comes with a ¼-28 threaded prop adapter. Although this large variety of ratios may overwhelm the novice electric flier, the following guidelines should lessen the confusion:

• if you want your model to go faster (but, unfortunately, climb more slowly), use

Flying the Model Electronics 10 Plus in the P-51 Mustang



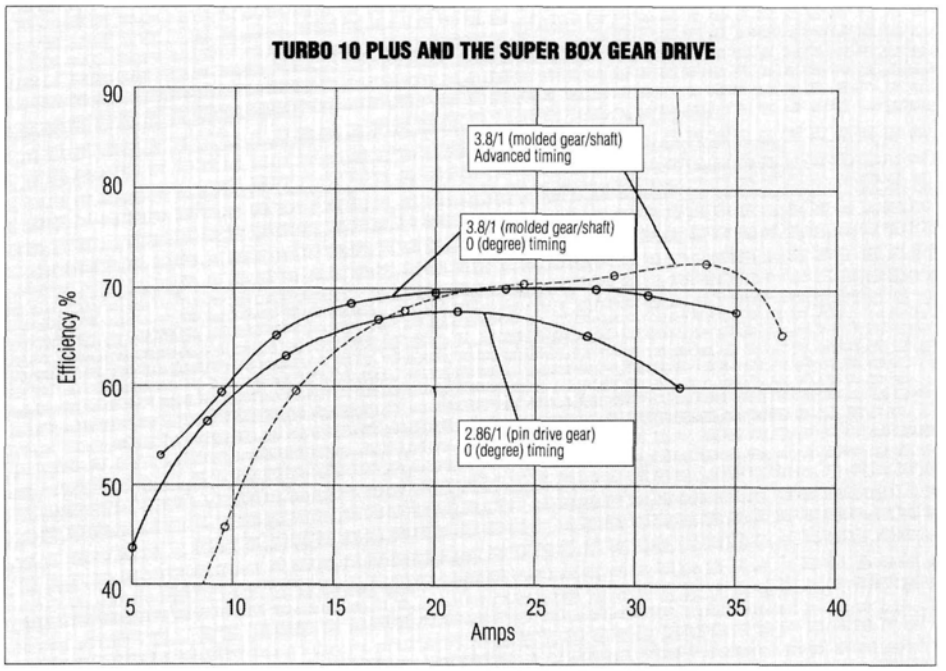
Turbo 10 Plus and Super Box (at 6:1) installed in the Mustang. The hardwood blocks are the author's way of preventing the motor from rotating in the cradle mount.

The all-foam, unpainted P-51 Mustang by Model Electronics weighed in at 45 ounces. It was equipped with two mini-servos, a full-size receiver, a Flight-Tech* 60A 6- to 12-cell BEC speed control, and a 1000mAh 10-cell battery on board. The Turbo 10 Plus motor and Super Box (using a 6:1 ratio), sporting a Sonic Tronics* 13x7½ folding prop, were installed in the model. At 0 degrees of timing (for sport flying and longer flights), this combination consumes 31.5 amps on 10 cells and turns the prop at 6,100rpm; it also produces 42 ounces of static thrust. The model was later flown at the advanced-timing setting (factory set). The extra current draw was put to good use (in excess of 35 amps); the model could then climb vertically. In this configuration, the model has a 22.5 ounce-per-square-foot wing loading, which is not terribly high. With higher capacity—and appropriately heavier—cells (1400 to 1700mAh), this model wouldn't be for novices.

Flying at 0 Degree Timing

The model was easily hand-launched into a cool, light, December breeze. Climb-out approached 60 degrees at a very sprightly pace. Climb could have been increased at a sacrifice of forward speed, but that wouldn't have been prudent on a first flight.

After a few hundred feet of altitude had been obtained, the model was throttled back to trim the controls. It was found that no trim was needed throughout the entire speed range. About 3 minutes of sport aerobatics and high-speed passes were performed before the batteries wore down to a point at which landing was inevitable (shucks!). A fresh battery was installed, and the prop was changed to a Model Airplane Products (France) 13x7½. The performance was sim-



lower ratios with smaller props;
• if you want to go more slowly (but climb more quickly), choose higher ratios with larger props.

The Super Box comes unassembled and, although it's tedious, the assembly isn't difficult. Because they have fewer parts, the molded gear/shaft units (which offer their own set of ratios) are a bit easier to build than the "pin-drive" main-gear versions. The pin-drive main-gear assembly consists of a white nylon gear that's slid onto a shaft with a pin installed at one end to form a "T." On its aft face, the gear has a molded recess that engages this pin. The gear transmits the torque from the motor to the drive pin, and the pin transmits it into the shaft. This type of assembly has worked well in R/C electric car and truck products for some time now.

The Super Box consists of front and rear aluminum plates with ball bearings and a gear trapped between them. Washers are used as spacers throughout the assembly and, because of variations in manufacturing tolerances, more than one washer may be needed to assemble the gearbox properly. Stacking washers while inserting screws through this assembly requires patience. I also found that many of the pin-drive gears that were supplied for testing were a bit sloppy on the shaft. The shaft (nominally 3/16 inch in diameter) was found to be a bit undersize. This sloppy condition did make gear lash difficult to set up. *[Editor's note: we've been informed by Model Electronics that this problem has been fixed. The thickness of the gear at the shaft has been increased and, because the gear hole has now been made slightly undersize, the gear fits more tightly on the shaft. These changes allow you to use fewer spacer washers between the front and back plates, so assembly is less tedious.]*

The instructions are quite good, and the many diagrams will lead you through assembly. I offer one caution: when assembling the pin-drive-type main gear, install the spring-steel E-clip in a transparent plastic bag. That way, if you slip when trying to install the clip and it flies off, you won't be searching your shop floor and benches all day instead of flying your new unit!

For the purpose of this review, I chose to test only the 3.8:1 ratio and the 2.86:1 ratio on the bench, and I flew only the 6:1 ratio in the Model Electronics P-51 Mustang.

SYSTEM TESTING

Because this motor was never intended to be run as a direct-drive unit, its performance was assessed with the gearbox installed. This requires that I speak of system efficiency instead of motor efficiency. Because it transfers power mechanically, the gearbox has losses associated with it (mostly friction) regardless of which motor is behind it. The efficiencies stated later in

ilar with this prop. Speed and climb may have been slightly better, but without telemetered data this would be hard to prove. The flight did last a bit longer; however, this could have been owing to the battery condition, rather than a more efficient prop. (Electric models just have too many variables to make decisions based on flight tests alone!)

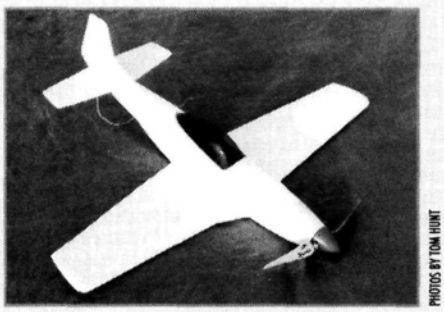
Flying At Advanced Timing

With the Sonic Tronics 13x7½ prop reinstalled, the model left my hand like an Estes rocket. Vertical climbs can be sustained as long as the battery lasts and there's air to move out of the way. Flights are appropriately shorter owing to the higher current drain. With the 1000mAh cells aboard, constant full-power flights barely lasted 2 minutes, but wow!; what an amazing 2 minutes! With a high-frequency speed control, you can throttle back and cruise at a much reduced power level.

The second flight was made with a 10-cell 1700mAh pack. The model's weight rose to 49.5 ounces. Still, with nearly 60 ounces of static thrust available, the model climbed vertically (although, naturally, a little more slowly than with the 1000mAh pack). Alternating between full-power aerobatics, cruise flight and very short gliding spurts (at 49.5 ounces, it's not much of a glider), I got a very pleasant 7-minute flight. At 6 minutes, I could still climb nearly vertical and roll all the way up!

Conclusions

Based on the data and the flight tests, this motor/gearbox combination has the potential to turn the heads of many "wet-power" fliers. The two models that Model Electronics offers for this propulsion system (Mustang and Zero) are for experienced fliers only—because of the power and wing loadings. For intermediate fliers, this motor/gearbox combination would be better suited to slower, scale models or larger (350- to 400-square-inch wing area), built-up models intended for sport flying. This power system's ability to swing large props at lower currents and higher efficiencies (at nearly neutral timing) also makes it ideal for general aviation (Cessna, Piper, Aeronca), sport-scale applications.



PHOTOS BY TOM HUNT

Model Electronics all-foam P-51 Mustang (shown unpainted; comes with scale-like Mylar decals for a Pacific-theater Mustang). It has an all-up weight of 45 ounces with 10-cell 1000mAh and BEC; 22.5 ounces per square foot of wing loading.

AUTHOR'S DATA

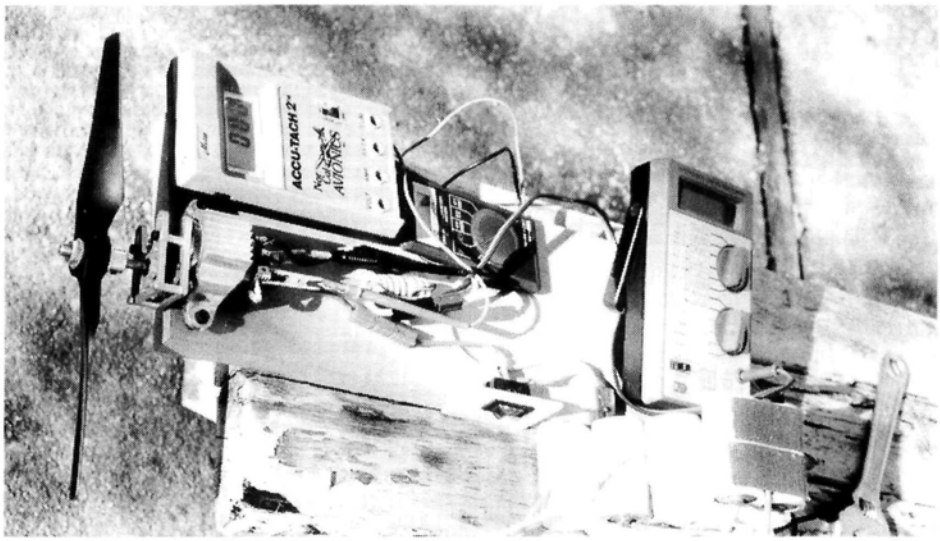
Products .....Turbo 10 Plus 10-Cell Motor and Super Box gearbox
Diameter .....1.415 in.
Length (motor) .....2.23 in. (bearing to bearing)
Length (motor/gearbox) .....3.7 in. (rear bearing to prop rear face)
Motor-shaft diameter .....⅛ in.
Prop-shaft diameter .....3⁄16 in.
Prop adapter (on gearbox) .....¼-28 thread
Weight (motor only) .....6.2 oz.
Weight (w/gearbox) .....7.7 oz.
Kv (rpm/volt const) as received (0 degrees timing) 4700
Armature resistance .....0.018 ohm
No-load current (10 cells) at approx. 0 degrees timing ..... 4.4 amps
As received (advanced timing) .....5 amps
List prices .....$98 (motor); $46.50 (gearbox)

Hits

- High power output.
- Low weight of system.

Misses

- Pin-drive gears a bit sloppy on shaft. (This has been addressed by the manufacturer; see text.)



Test setup for measuring motor/gearbox performance: Norcal tachometer, voltmeter and volt/amp with shunt. SR Batteries* D-size Ni-Cds (5000mAh) used to test high currents for extended periods without recharging.

this article are naturally lower than those of direct-drive motors because the power losses in the motor and gearbox are combined.

The motor/gearbox combination was tested on my test stand using two ratios: 3.8:1 (molded main gear/shaft) and 2.86:1 (pin-drive main gear). The unit was tested first with the motor timing set at 0 degrees and then at the factory's advanced-timing setting. At 0 degrees, system efficiencies were slightly higher (around 70 percent; see graph) for the molded gear/shaft 3.8:1 ratio. This could be due to the more secure fashion in which the main gear is affixed to the prop shaft, or because the motor rpm and load using this arrangement produced a higher efficiency. The system efficiency curve also remained higher for longer with the higher (3.8:1) ratio. This suggests that the motor rpm range was more appropriate to obtain these higher efficiencies. Also note that maximum efficiency occurred at around 20 amps with the 2.86:1 ratio and closer to 25 amps with the 3.8:1. Because this motor is capable of sustaining continuous currents in excess of 30 amps, it's obvious that the higher gear ratios allow this motor/gearbox combination to perform more efficiently.

At the advanced-timing position, the maximum-efficiency point was higher (near 35 amps). System efficiency was, surprisingly, about the same at 25 amps (around 70 percent). The advanced timing did, however, hurt efficiency at cruise-type amp draws (15 to 20 amps). If you plan to fly this unit at these currents, set the timing to near 0 degrees or only *slightly* advanced.

Last, to acquire thrust and amp-draw data, I tested various propellers with the 6:1 ratio. (This data is shown in the accompanying chart.) Using up to 10 cells and limiting the static current to near 40 amps, many propellers developed 40 or more ounces of thrust at 0 degrees timing. At the advanced-timing position, thrust in excess of 70 ounces can be obtained. The Mustang, as the author built and configured it, weighed only 45 ounces. Vertical performance was exceptional!

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

PROP CHART

Performances Noted with 0° Timing and Advanced Timing. Tested at 6:1 Ratio.

0 Degrees Prop	Volts	Amps	Rpm	Thrust (oz.)
13x8 Master Airscrew (wood)	6.79	32	4,300	42
13x7½ Model Airplane Products	7.45	19.5	5,100	27
14x7½ Model Airplane Products	7.14	24.5	4,800	38
14x8½ Aeronaut	7.26	22.6	4,800	34
14x8½ Aeronaut	7.90	28.6	5,300	42
14x7½ Model Airplane Products	7.68	30.3	5,200	45
13x7½ Model Airplane Products	8.11	24.2	5,800	35
13x7½ Model Airplane Products	9.72	27.5	6,100	41
13x7½ Sonic Tronics	9.45	31.5	6,100	42
11x9 Master Airscrew (wood)	8.45	33.0	5,800	36
11x8 Top Flite Nylon	9.22	23.8	6,600	35
11x8 Top Flite Nylon	9.96	26.8	7,100	40
Advanced				
13x8 Master Airscrew (wood)	8.36	47	6,300	66
13x7½ Model Airplane Products	10.10	32	7,000	56
14X7½ Model Airplane Products	9.00	40	6,100	71
14X8½ Aeronaut	8.78	43	5,300	68
13X7½ Sonic Tronics	9.90	37.5	6,900	59
11X9 Master Airscrew (wood)	9.33	37.1	6,400	46

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R/C WORLD ORLANDO, FL, CONDO RENTAL: 2 bedroom, furnished. Available weekly or monthly. Low rates. 100-acre flying field with enclosed hangars. Close to Disney World and Epcot Center. For information, please call or write to R/C World, 1302 Stearman Ct., Orlando, FL 32825; (407) 380-6359.

WANTED: built or partially built Ercoupes, Cessna 150, 152, 172, 182, Grumman American Tiger (AA5), American Yankee (AA1), or Mooney M-10 Cadet. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585 [5/95]

MAKE REAL DECALS with your computer and printer! Send $10 for starter kit and instructions to LABCO, 27563 Dover, Warren, MI 48093-4764 [5/95]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537 [5/95]

MODEL MOTORS WANTED—Most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [9/95]

GERMAN AIRCRAFT WW II—handbooks, service part lists, instruction manuals. List—$2. Udo E Hafner, Eugen-Bolz-Str. 15, D-71636 Ludwigsburg, Germany. [5/95]

FLY DAVE BROWN SIMULATOR. Use your transmitter. Works with Futaba, JR, Airtronics, Hitec. Uses Standard joystick connection. For more info, contact Computer Designs, 8530 N. Montana Ave., Helena, MT 59601;(406) 458-9416. [7/95]

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ANTIQUE IGNITION-GLOW PARTS CATALOGUE, 1/2-inch thick, timers, needle valves, cylinder heads, pistons, points, tanks, spark plugs, racecar parts. Engines: 1/2As, Baby Cyclones, McCoys, Phantoms, etc. $8 postpaid (U.S.); $20 foreign, Chris Rossbach, R.D. 1, Queensboro Manor, Box 390, Gloversville, N.Y. 12078. [8/95]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/95]

CARS. Selling model collection, 1973 issues up, 1/24-1/25, individual prices, about 800. Ralph, Box 2423-P, Yakima, WA; (509) 965-0670. [5/95]

DO YOU SPEAK MODEL AIRPLANE? Seventy years of aeromodeling history! All the heroes, contests, models! Paperback, 320 pages, $19.95 postpaid. Also: Old Buzzard's Soaring Book, $16.95. Dave Thornburg, 5 Monticello, Albuquerque, NM 87123; (505) 299-8749 for Visa/MC [6/95]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/95]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [9/95]

WANTED: OLD, ready-to-run, gas-powered cars, airplanes and boats. Complete or parts. Please write: Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [6/95]

DRAWINGS ACCURATELY enlarged and copied. Any scale; any size; three-views; magazine plans; old-timers; antiques. Money-back guarantee. Send $2 for info. Roland Friestad, 221 MAN 155th St., Cameron, IL 61423. [5/95]

PLANS TO BUILD more than 700 tools, machines and accessories for your shop. Catalogue–$1. Wood-Met. Dept. MAN, 3314 W. Shoff Cir. Peoria, IL 61604-5964. [9/95]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [5/95]

MODEL BOATS: buy, sell, trade, search, restore, or custom-build. Bob Langert, 2350 250th St., Space #30, Lomita, CA 90717; (310) 326-9106. [5/95]

WANTED: Futaba Single-Stick Radio PCM Helicopter System—whole system or transmitter-only. Bob Vomero; (814) 825-8404. [5/95]

HISTORIC REPLICAS: Flying Tigers, 94th Aero, Lafayette Escadrille accessories; pilot sport shirts, T-shirts, wings, medals, beer steins, scarves; WW I squadron pins–from $4.95. Free gift with order. Catalogue–$1 (refundable). Company of Eagles, 875A Island Dr., Ste. 322N, Alameda, CA 94502. [6/95]

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INTERNATIONAL AIRCRAFT RESEARCH. Need documentation? Include name of aircraft (for availability of documentation) and $3 for three-view and photo catalogue. 1447 Helm Ct., Mississauga, Ontario, Canada L5J 3G3. [7/95]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/95]

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Aeroloft Designs, *2940 W. Gregg Dr., Chandler, AZ 85224.*

Aeronaut; *distributed by Hobby Lobby Intl. (see address below).*

Astro Flight Inc., *13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.*

Aveox, *P.O. Box 1287, Agoura Hills, CA 91376; (818) 597-8915; fax (818) 597-0617.*

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Byron Originals, *P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.*

Cabral Systems Inc., *2459 S.E. Tualatin Valley Highway #465, Hillsboro, OR 97123-7919; (503) 629-9378; fax (503) 648-2261.*

Carl Goldberg Models, *4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550.*

Coverite, *420 Babylon Rd., Horsham, PA 19044; (215) 672-6720; fax (215) 672-9801.*

DAD (Design & Development Corp.), *168 Main St., P.O. Box 711, Chadron, NE 69337; (800) 669-4548.*

D.G.A. Designs, *16 Main St., Phelps, NY 14532.*

Du-Bro Products, *P.O. Box 815, Wauconda, IL 60084; (800) 848-9411.*

Dynathrust Props, *Box 91, Georgetown, TN 37336; (615) 476-2330.*

F&P, *622 Taylor Ave., Oradell, NJ 07649.*

Flightech Models Inc., *1411 N. Mayfair Rd., Milwaukee, WI 53226.*

Futaba Corp. of America, *P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888.*

Great Planes Model Distributors, *P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-3630.*

Hobby Lobby Intl., *5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.*

Horizon Hobby Distributors, *4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.*

JR Remote Control; *distributed by Horizon Hobby Distributors, (see address above).*

Jet Model Products, *211 N. Mullen Rd., Belton, MO 64012; (816) 331-0356.*

K&B Mfg., *2100 College Dr., Lake Havasu City, AZ 86403; (602) 453-3030; (602) 453-3559.*

K.J. Miller Corp., *22711 County Rd. 14, Elkhart, IN 46515.*

Klotz Special Formula, *P.O. Box 11343, Fort Wayne, IN 46857.*

McKay Chemical Co., *920 Randolph St., Huntington Park, CA 90001.*

Midwest Products, *P.O. Box 564, Hobart, IN 46342-0564; (800) 348-3497.*

Model Electronics Corp., *6500 Sixth Ave., N.W., Seattle, WA 98117; (206) 782-7458.*

Model Graphics, *121 Cove Rd., Hemphill, TX 75948.*

MonoKote; *distributed by Great Planes Model Distributors (see address above).*

Nick Ziroli Models, *29 Edgar Dr., Smithtown, NY 11787.*

Northeast Sailplane Products, *16 Kirby Ln., Williston, VT 05495.*

Ohio R/C Models, *4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660; fax (513) 859-7202.*

O.S. Engines, *distributed by Great Planes Model Distributors (see address above).*

Pacer Technology, *9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.*

PFM; *distributed by Precision Model Products, 14423 Hix, Livonia, MI 48154; (313) 464-8594.*

Pica-Robbe Inc., *2655 N.E. 188th St., Miami, FL 33180.*

Quadra-Aerrow Inc., *P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H 3E3.*

Randolph Products, *P.O. Box 830, Carlstadt, NJ 07072-0830.*

RJL Industries, *P.O. Box 5, Sierra Madre, CA 91025; (800) 359-6972.*

Robart Mfg., *P.O. Box 1247, St. Charles, IL 60174; (708) 584-7616.*

Sig Manufacturing Co. Inc., *401 S. Front St., Montezuma, IA 50171; (800) 247-5008; fax (515) 623-3922.*

Slimline Mfg., *P.O. Box 3295, Scottsdale, AZ 85271; (602) 967-5053; fax (602) 967-5030.*

Slegers International, *Rte. 15, Wharton, NJ 07885; (201) 366-2525; fax (201) 366-0549.*

Soaring Stuff, *9140 Guadalupe Trail N.W., Albuquerque, NM 87714; (505) 898-8281.*

Sonic Tronics, *7865 Mill Rd., Elkins Park, PA 19027; (215) 635-6520; fax (215) 635-4951.*

SR Batteries, *Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.*

SWB Turbines, *1120 Meadowview Dr., Manasha, WI 54952; (414) 725-9562.*

Top Flite; *distributed by Great Planes Model Distributors (see address above).*

Top Gun Aircraft, *801 Canal St., Wing A, Ottawa, IL 61350.*

Tru-Turn, *P.O. Box 836, South Houston, TX 77587; (713) 943-1867.*

Vailly Aviation, *18 Oakdale Ave., Farmingville, NY 11738; after 6:30 p.m. EST (516) 732-4715.*

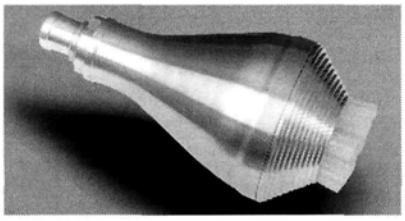
Warpaints Ltd., *2830 Godwin Ln., Pensacola, FL 32526; (904) 944-3495.*

Yellow Aircraft, *203 Massachusetts Ave., Lexington, MA 02173; (617) 674-2222; fax (617) 674-2188.*

Ziroli; *see (Nick Ziroli).*

ADVERTISER INDEX

PRODUCT NEWS

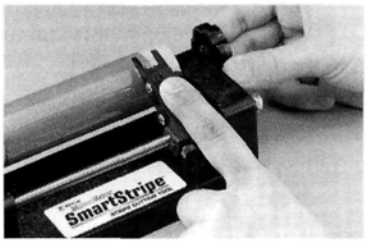


ARISE
Muffler Extension

Designed to reduce 2-stroke engine noise up to 10dB measured at 10 feet, the Arise muffler extension fits snugly to the front half of the original muffler. It will work with .25 to 1.08ci engines without affecting power output and, in some cases, may even improve performance. This solid-aluminum extension weighs only 1 ounce, and it comes with illustrated instructions.

Price—$37.95 (plus $5 S&H).

Arise, 1320 Rte. 9, P.O. Box 158, Champlain, NY 12919; (800) 370-2320.



TOP FLITE
MonoKote SmartStripe

Use this tool to custom-cut precise trim stripes out of MonoKote and other iron-on coverings. Just wrap a piece of covering around the tool's wooden roller, dial the stainless-steel cutter to the exact width you want (from 1/64 inch to 5 1/4 inches in 1/32-inch increments), press lightly on the blade, and turn the roller. Complete the cut and unwrap the strip; it's ready to be applied. You can attach the SmartStripe to your workbench using the mounting slots on its base. It comes with a replaceable no. 11 knife blade and is protected by a 5-year warranty. Extra rollers are also available.

Part no.—TOPR2420; **price**—$29.99.

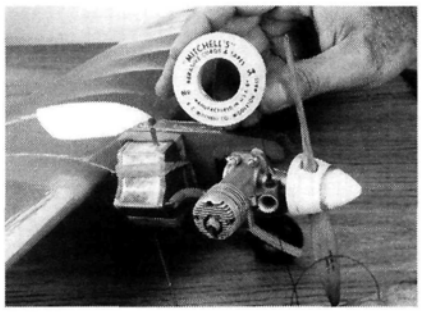
Top Flite; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-3630; fax (217) 398-0008.

ATLANTIC R/C PRODUCTS INC.
Mixture Valve

Now you can control your glow-plug engine's mixture from anywhere on the model or during flight. This valve doesn't require any engine modifications; it simply pinches the fuel line to control the mixture. It's available with a long 1 1/4-inch adjustment screw or a short 3/8-inch adjustment screw (recommended for in-flight control).

Prices—$9.50 each, or two for $17, plus $2.50 S&H (specify short or long screw).

Atlantic R/C Products Inc., P.O. Box 523007, Springfield, VA 22152; (703) 913-7278.

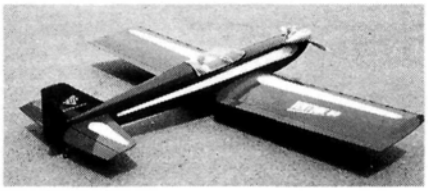


E.C. MITCHELL CO. INC.
Abrasive Cords

Available in 12 sizes from 0.012 to 0.150 inch diameter, these flexible cords can fit into tiny holes, tubing and slots to clean and repair model airplane engines. Mitchell's abrasive cords are available impregnated with aluminum oxide, silicon carbide, or crocus for ultra-fine polishing. The 50-foot-long cords come in tape-like spools. For a brochure with a size-selector chart, contact E.C. Mitchell Co.

Price—$12.50 and up.

E.C. Mitchell Co. Inc., 88-90 Boston St., Middleton, MA 01949-0907; (508) 774-1191; fax (508) 774-2494.

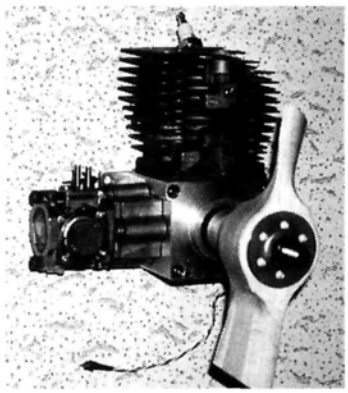


BRUCE THARPE ENGINEERING
Venture 60

This ultra-simple sport R/C plane is designed to perform graceful aerobatics at mild speeds. The kit features accurately machined parts, top-quality wood and hardware, rolled plans and detailed instructions. Specifications: wingspan—72 inches; wing area—876 square inches; weight—7 1/4 pounds; engine required—.60 to .65 2-stroke or .65 to .80 4-stroke.

Price—$109.95 plus S&H.

Bruce Tharpe Engineering, 13555 E. Evans Creek Rd., Rogue River, OR 97537; info: (503) 582-1708; orders: (800) 557-4470.



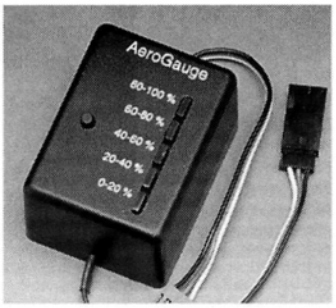
J&K PRODUCTS
J-44 Racing Engine

This high-torque, 4.4ci engine is designed to pull high-pitched props. It reaches its maximum horsepower at 8,500rpm and has six intake ports and three ball bearings on its crankshaft. Other features include a large reed-port induction, a 28mm carb and CDI ignition. The 6-pound engine is available in gas- and alcohol-burning versions.

Price—$750.

J&K Products, P.O. Box 627, Keno, OR 97627-0627; (503) 883-4062.

PRODUCT NEWS



MEASUREMENT AND CONTROL PRODUCTS
AeroGauge

This device uses state-of-the-art technology to measure the stored charge in a receiver's batteries and display it on an LED. The AeroGauge actually "learns" the batteries' capacity over time and even compensates for temperature changes. The 2x1½x1-inch unit weighs 1 ounce and comes with a 30-day money-back guarantee and 90-day warranty. Use it with battery packs that have a capacity of 500mAh to 2000mAh.

Price—$49.95.

Measurement and Control Products, 16027 Brookhurst St., Ste. G-224, Fountain Valley, CA 92708; (714) 775-7991.

FLITZ INTL. LTD.
Flitz Optima

Polish, protect and preserve metal, Plexiglas, fiberglass and gelcoated and painted surfaces using this non-toxic, non-abrasive cleaner. Flitz Optima is guaranteed to protect your models from rust, tarnish and corrosion for up to six months. For a free sample, write to Flitz Intl.

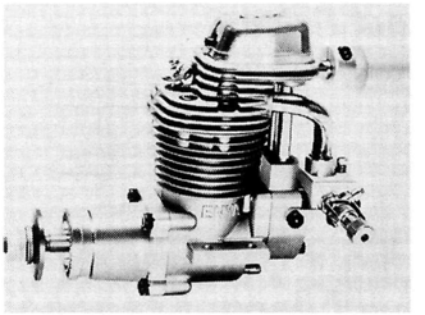
Flitz Intl. Ltd., 821 Mohr Ave., Waterford, WI 53185; (800) 558-8611 or (414) 534-5898; fax (414) 534-2991.

WENDELL HOSTETLER'S PLANS
1/4-Scale Gee Bee R2

Featuring all balsa, basswood and plywood construction, the plan for this 1932 racing sensation comes on two 42x96-inch detailed sheets. The plan deviates slightly from exact scale to enhance the model's flying characteristics. All parts and accessories can be purchased from Byron Originals. Specifications: wingspan—80 inches; weight—22 to 25 pounds; engine required—3ci to 5ci.

Price—$32.50 plus $3.50 postage (add $2.50 for rolled plans).

Wendell Hostetler's Plans, 1041 Heatherwood Ln., Orrville, OH 44667; (216) 682-8896.

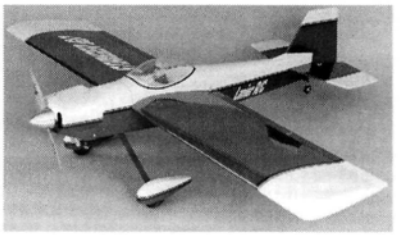


ALTECH MARKETING
Enya .41-4C Engine

Designed to have a narrow crankcase that will fit in narrow cowls, this 0.7hp 4-stroke engine can swing 10x6 to 12x6 props in 4- to 7½-pound airplanes. Specifications: bore x stroke—0.877x0.669 inch; rpm range—2,500 to 13,000; weight—13.2 ounces; height—3⅛ inches; crankshaft thread—¼-28.

Part no.—JC41X.

Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.



LANIER RC
Stinger 60

This built-up kit has foam wings with plug-in aluminum spars, and it comes with a plastic turtle deck, cowl and wheel pants. Specifications: wingspan—60 inches; wing area—810 square inches; fuselage length—44 inches; weight—6½ to 8 pounds; engine required—.61 to .92 2-stroke or .60 to .90 4-stroke.

Part no.—95220; **price**—$169.95.

Lanier RC, P.O. Box 458, Oakwood, GA 30566; (404) 532-6401.

GLOBAL HOBBY DISTRIBUTORS
Kwik Bond 3-PAK

This limited-time offer includes three 1-ounce Kwik Bond CA adhesives (thin, thick and slow) and three Kwik Tips. See your local hobby dealer for the full line of Kwik Bond CA adhesives, accelerators, de-bonders and other gluing accessories.

Price—$9.99.

Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**. **Manufacturers!** To have your products featured here, address the press releases to **Model Airplane News,** attention: Product News, 251 Danbury Rd., Wilton, CT 06897.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

CONGRATULATIONS to Frank W. Beatty of Granite City, IL, for correctly identifying the February '95 mystery plane. The German-built Adler G.II Rb. was the first product of the Adlerwerke Vorm. Heinrich Kleyer A.G. company, which was formed in 1934. The small, light biplane had all-steel construction, and it was used in aeronautical engineering and manufacturing schools, as well as for sport and tour flying. Its robust construction and ease of repair made it popular in the growing field of general-aviation aircraft. The G.II's wingspan was 23 feet, 8 inches; its fuselage was 20 feet, 9 inches long; and its wing area was 134.6 square feet. The fabric-covered wings had two steel-tube spars in each wing panel, and the ribs were formed out of light, steel tubes that were bent to shape. The airplane was powered by an 80hp Hirth 60R, 4-cylinder, in-line, inverted, air-cooled engine, and it had a maximum speed of 111.7mph and a range of 342 miles. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

FINAL APPROACH

FLYING THE F-117

The awesome ability of the F-117 Stealth Fighter to deliver laser-guided bombs with pinpoint precision, and without being detected by radar, has captured the popular imagination since the Gulf War. But how does the R/C model of this unusual-looking aircraft fly? We asked Bob Fiorenze, who served as a test pilot in the R&D program for Yellow Aircraft's* scale F-117.

Yellow Aircraft's scale F-117 flies quite well without any need for gyros.

SETUP

The 25-pound, 9-channel model is powered by twin O.S. 91s driving Dynamax fans and uses 7-percent-nitro smoking ducted-fan fuel. Two channels allocated to elevator and aileron actuate elevons. When you give an elevator command, the canted rudders (which act as partial elevators) and the elevons move. As first set up, a rudder command actuated both the rudders and the nose-wheel steering. Later, realizing that rudder was not essential in flight, Bob split the rudder channel into brakes and parachute using a single, three-position switch. Two channels control left and right engine mixture in flight. Three redundant pneumatic systems drive landing gear, gear doors and brakes.

FLIGHT

The F-117 is designed to provide a stealthy, stable platform for delivering warheads. The model, with a relatively forward CG, turns out to be a docile, stable aircraft that does not need gyros (the full-scale plane, with an aft CG, requires constant computer corrections). Because there is no propwash directly over the control surfaces, the model is relatively smooth in its response to power and control inputs, which contributes to a sense of scale realism.

• **Takeoff.** Prior to takeoff, brakes are applied, and engines are spooled up to approximately 60-percent power. Then brakes are released and engines powered up to 100 percent for the approximately 250-foot takeoff roll. Bob notes, "When takeoff velocity has been achieved, you input about half to three quarters elevator to rotate the plane, and it naturally lifts off. The rate of ascent is about 1,000 feet per minute, so I usually bring it back to about 200 feet per minute, so that it looks more scale-like."

• **Flying.** Overall, the plane "flies like it's on rails." The effective dihedral—from the tremendous sweep—makes it quite stable when flying upright. Bob does caution that because of its unique profile, its heading can be a little ambiguous, so you always want to keep in mind where it has just been. Lift-robbing, steep-bank angles are to be avoided, particularly at low altitude.

The F-117, which has a relatively flat bottom, is not designed for aerobatics. Inverted, with full down-elevator, it will hold sustained flight. It will also do a nice military arcing roll. Bob notes that he tries not to fly at full throttle all the time. The carbs tend to go rich in the mid-range, so it's good practice to throttle back to 65 or 70 percent in cruising flight to reduce rpm and engine heat. Bob has circled the field on one engine.

Test pilot Bob Fiorenze next to the F-117.

• **Landing.** Bob sets up for landing with a long downwind leg. "Ease your throttle down by a few detents as you start adding up-elevator. At all times, you want to watch the nose-high attitude of the plane so that you won't get behind the power curve. As with any larger, scale airplane, you don't want to take a chance of wallowing into the ground."

He observes that, after touchdown, 50 percent of the parachute deployment is for actual braking, and 50 percent is for "wow." A 20-inch-diameter chute with no holes lets the plane track like an arrow. After it has slowed a bit, brakes are applied.

For further information on this remarkable model, contact Bob at 420 W. S.R. 434, Winter Springs, FL 32708; (407) 327-6353. The kit is expected to be available in late '95.

—Tom Atwood

**Address is listed alphabetically in the Index of Manufacturers on page 138.* ■